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THE
GEOGRAPHICAL REVIEW

VOL. VIII JULY, 1919 NO. 1

THE WORK OF FRANCE IN MOROCCO

By ALFRED DE TARDE
Editor of *France-Maroc*

Morocco of the old days is passing. Pierre Loti's sleeping Maghreb, "impenetrable to things that are new," awakens to a vitality that a recent American visitor has declared reminiscent of the Far West. This new Morocco is the creation of one man—General Lyautey. Named Resident General in April, 1912, after the signing of the French protectorate treaty with Morocco, General Lyautey has held this office without intermission save for four months (December, 1916-April, 1917) when called to the Ministry of War.

POLITICAL EVENTS

To appraise his work at its proper value the recentness of the events must be borne in mind. It was in 1907 that the first French troops were disembarked at Casablanca to establish order and to protect the European residents. At the time Morocco was under the régime of the Act of Algeciras (1906), that is under an international protection, with policing duties specially devolving on France and Spain, an agreement, however, which proved impotent to suppress anarchy. France found herself compelled to resort to military intervention, thereby arousing the opposition of Germany. There followed a series of events concluded by the accord of November 4, 1911, with Germany and, shortly afterwards (March 30, 1912), by the above-mentioned protectorate treaty with Morocco. Seven years have elapsed since the date which gave France the right to act in Morocco—that is in her sphere of influence as delimited by previous agreement with Spain. At the time when France took up the work of political and economic organization everything remained to be done—restoration of the disordered administration; establishment of the bases of economic development; installation of medical, educational, and other service; reform of the land system. At the same time peace had to be

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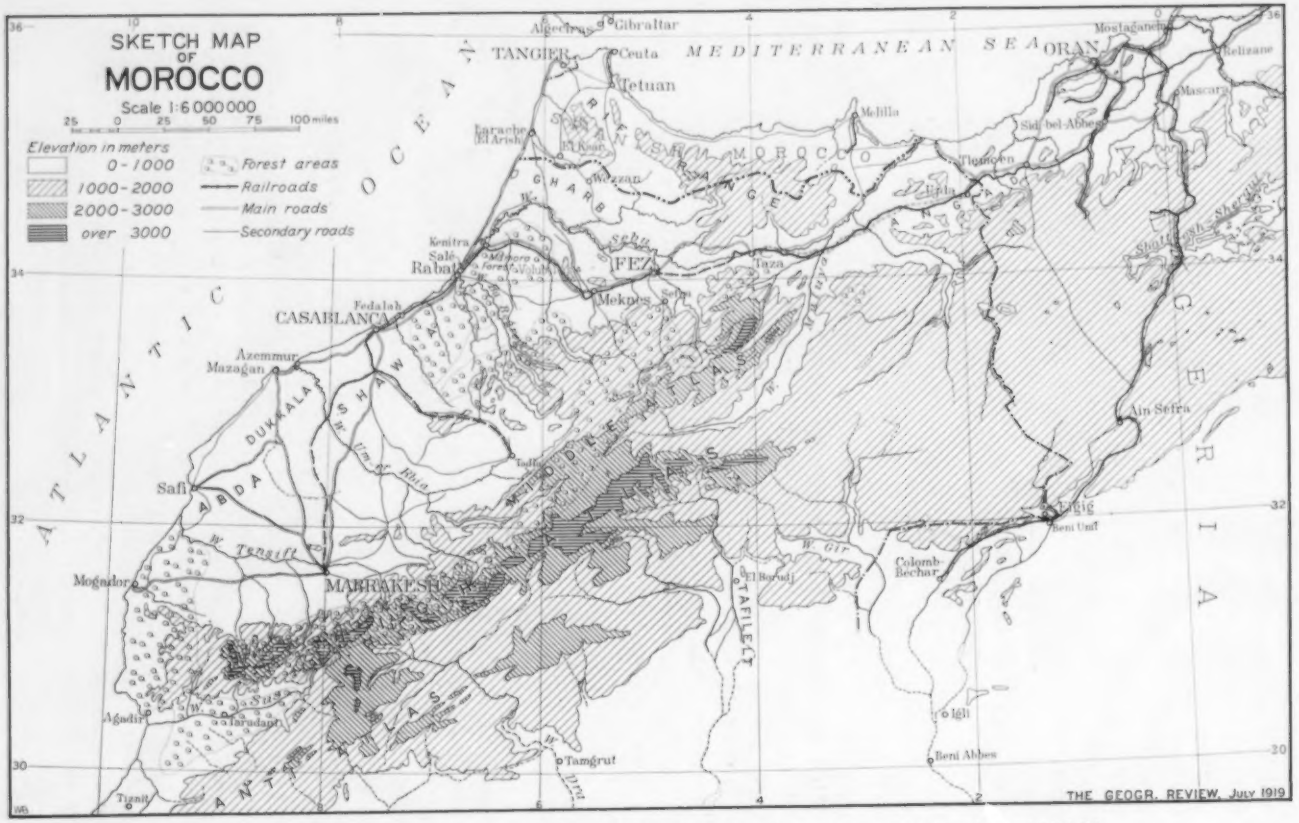


FIG. 1—Sketch map of Morocco showing the natural features and the means of communication. Scale, 1:6,000,000.

assured and a rebellious population pacified by the combined application of force and persuasion.

The task was immense in itself. It was rendered still more difficult by the course of external events. Two years after France had taken up her task the European war broke out. Should the work in Morocco be suspended? So some thought in the stress of the first days. There was a call for immediate abandonment of all the country except the coasts. But General Lyautey, with a clear outlook on the future, answered differently. He despatched to France the forces summoned for national defense, guaranteeing to hold Morocco with the remainder. As a protective shield he flung the last of these active troops to the borders of the pacified territory, trusting the peace of the interior to a policy of public works and general development.

This policy he has applied without relaxation since August, 1914. Its success is patent, for not only has Morocco remained peaceable during the war despite the efforts of German propaganda but the zone of pacification has been extended. Today the occupied area exceeds 250,000 square kilometers where at the outbreak of the war it was 180,000 square kilometers.[1]

General organization of the country has kept pace with military events. The advance of the army has been strikingly co-ordinated with the civil work, which we now proceed to discuss. Morocco affords a convincing example of what can be accomplished through the vigorous prosecution of a policy well defined and firmly fixed along broad lines.

The Civil Conquest

The fundamentals of this policy must briefly be noted, for they illuminate the entire field of French work in Morocco—even more, they reveal the difference between that nation's general colonial policy, sometimes, but unjustly, described as French imperialism, and German imperialism. In a tractate "Le rôle colonial de l'armée," written in 1900 after experience gained in Madagascar, General Lyautey laid down certain principles of colonial warfare. Principle and method are expressed in the short formula: *L'armée aux colonies, c'est une organisation qui marche.*

Occupation is not effected for the sole profit of the conqueror but has due consideration for the conquered. The advancing army leaves behind it elements of established order; extension of conquest and extension of order are in fact synonymous. In colonial warfare the offensive has a particular character. It takes careful cognizance of the sources of future well-being and limits destruction to a minimum. The village taken at the point of the sword today may be the market of tomorrow. Operations are naturally conducted on different lines when the campaign is merely

[1] See the note on "The French Penetration of Morocco," with map, in the Geographical Record in the present number. For a recent general article on Morocco under the French régime, see also: A. Brandes, Marokko. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.* Vol. 36, 1919, pp. 306-327, with map.—Edit. Note.

FIG. 2—Panoramic view of Fez, the most beautiful and interesting city of Morocco. Since its foundation at the beginning of the ninth century this "holy city" has played an important part in the history of the country. "How large, how populous" its state in the early sixteenth century Leo Africanus has described in his history of Africa (*Hakluyt Soc. Publs.*, First Series, Vols. 92, 93, 94, 1896). The location of the city in the strategic and commercial passageway connecting the Mediterranean and the Atlantic between the Rif Range and the Middle Atlas ensures its future progress.

one of invasion and conquest from those employed in a campaign to open a road of future commercial penetration. Morocco furnishes an excellent illustration in the narrow-gage lines constructed for military purposes but not the less adaptable for subsequent commercial use. In the building of such lines connection between the chief economic centers has been kept in view.

Under this conception the army is not merely a unit designed for combat but a complete society in miniature. It embraces not only soldiers but workmen of all trades—masons, carpenters, laborers, farmers, teachers, doctors. In Morocco, for instance, the army has constructed posts, built roads and bridges, and established railways and telephone lines—in fact has completely prepared the way for economic organization.

In place of the old idea of conquest has been substituted that of cooperation with the native peoples. The occupying force, having in mind pacification and enrichment of the country for the natives no less than itself, has respect for the established authority. Instead of wasting its efforts to replace existing organizations by new systems naturally mistrusted by the people, it is satisfied to re-enforce them by wise control.

The Administrative Organization

When the protectorate treaty was signed Morocco was submerged in anarchy. The power of the Sultan was on the wane; most of the country with the exception of Fez, Meknes, and the coast was in rebellion against him. After affixing his seal to the treaty Sultan Mulai Hafid abdicated, and the Makhzan (Moroccan government) nominated his brother, Mulai Yusef, as his successor.

The Sherifian Empire is a theocratic state. The Sultan, as "Descendant of the Prophet", enjoys absolute power; his religious authority is one with his political authority, as the religious law is not distinguished from the civil law. The Sultan governs with the aid of his ministers, or viziers, at the head of whom is the Grand Vizier, charged with internal affairs. The entire administration of the country proceeds from the court of notables who assemble every morning in the Sultan's palace, each sitting in his little *benika*, or audience chamber, opening off the principal court.

This administration has been preserved in its original form by the French authorities. The Sultan retains all his prerogatives; he exercises his office with all its traditional apparatus. The personnel of the palace, the Sherifian family, and the royal harem are maintained by a civil list of 3,500,000 pesetas. The viziers also continue their functions according to past custom. But certain of the old offices of the Makhzan have become obsolete; for example that of the Vizier of Foreign Affairs. His seat is now filled by the French Resident General, the sole intermediary between the Sultan and foreign powers. Furthermore, several technical depart-

FIG. 3

FIG. 4

FIG. 3—The administrative council, or Makhzan, of the Sherifian Empire, one of the last vestiges of the régime of the Middle Ages. While the protectorate has preserved the original form and apparatus of government, new offices provide for the development of the country.

FIG. 4—The Sultan receiving presents according to custom from townspeople and tribesmen. The ceremonial of such occasions is described by Aubin in "Le Maroc d'aujourd'hui" (1904).

FIG. 5

FIG. 6

FIGS. 5 AND 6 – Rabat-Salé, twin towns at the mouth of the Bu-Regreg. Fig. 5 shows the port of Rabat, now in the course of improvement. The opening of new quays has already augmented the trade even during the war. Facilities will be greatly enhanced by the projected dredging of a channel across the estuarine bar. Fig. 6 shows a market at Salé. Everywhere in Morocco, where modern trade methods are just appearing, the periodic markets and fairs are scenes of great activity socially and politically as well as commercially.

ments have been created—such as those of Public Works, Public Lands, Finance, Agriculture, and Postal Service. These are entrusted to French functionaries, who thus in reality serve as Sherifian ministers. Administration of the towns remains with the pashas, delegated by the Sultan, and those of the tribes with the *kaids*.

As remarked above, in the native system of justice the religious and civil law are identified. In all personal matters, such as marriage and inheritance, judgment is given according to the customary law (*shrâa*) drawn from the Koran. The judge (*kadi*) himself receives official recognition only under the appointment of the Sultan.

What, then, is the rôle of France in Morocco? That of supervision only. By the side of the organizations maintained or restored authorities have been installed who are charged with powers of surveillance or are authorized if necessary to furnish suggestions and advice. Acting side by side with the Makhzan is the Secretariat General with its three departments—of the Interior, of Justice, and of the Religious Estate (*habûs*, inalienable properties)—which are in permanent relation with the corresponding ministries of the Makhzan. Associated with the pashas, the kaids, and the kadis are the intelligence officers (*officiers de renseignements*) for the territories still under a military régime and the civil controller for the pacified regions under civil administration. We must pause for a moment over the former office for it is the most distinctive feature of the French protectorate system. Under other forms it also exists in Tunisia and Algeria.

The officer of this intelligence service is at once a military man, a diplomat, and an administrator. His rôle, especially on first installation, is to become acquainted with the people, to gain their confidence, to make them forget the call of the old freedom in the advantages of their present situation. At the same time he must sow the seed of pacification in the unconquered territory. Later his rôle becomes more administrative and then he acts as counselor. He reorganizes justice and instruction, establishes medical assistance, aids the agriculturists. The service thus calls for a man of unique ability who is furthermore a master of *finesse;* he must be omniscient—to the extent of having a knowledge of Berber dialects as well as a perfect knowledge of Arabic; but most of all he must have an understanding of the workings of the native mind. This service may be described as the keystone of France's Moroccan policy.

It may also be added that in the large towns the native municipalities (*medjless*) have been reorganized and that these assemblies, presided over by a French officer, conduct their own affairs. Among the tribes the assemblies of headmen (*djemâa*) have likewise been reconstituted, and to them great powers have been entrusted.

This liberalism in the political administration of the country is not a feint. It is implicit in the objective of the protectorate—the development

of the territory. Industrial and commercial life can only take root and flourish under conditions of general security.

Economic Equipment; the Ports

One of the first measures in establishing the protectorate was the drawing up of a scheme of economic policy, including a program for public works. Though the pacified area was then of small extent, the program was large in scope, for it looked to the future and, moreover, the order

Fig. 7—Airplane photograph of the eastern, or European, section of Casablanca, the first port of Morocco.

was to move quickly. The problem of the ports, the economic keys to the country, naturally demanded first attention. To avoid dissipation of efforts and resources there was adopted the principle of "one major port, several secondary ports." Choice of the chief port fell on Casablanca. Thither European commerce was directed for the most part, and interests acquired there were already considerable; furthermore it is the natural outlet for the rich regions of the Shawia (Fr., Chaouia) and Tadla. The project for Casablanca, for which the sum of 44,000,000 francs was appropriated, includes a great pier 1,900 meters long, which shall afford protection against the heavy seas characteristic of most of the western coast of Morocco, and a second pier 1,550 meters long transverse to the first. The anchorage area thus enclosed will measure some 140 hectares with a depth of over ten meters. Provision is also made for enlargement. Inside the

outer port is a small harbor, 9½ hectares in extent, for small vessels.[2] Construction of the larger pier, the principal part of the work, was begun first; today it is half completed, progress having been slackened through the difficulty of obtaining material, especially cement. The small inside harbor is already in working order. When the entire plans are completed Casablanca will be able to accommodate a traffic of 1,500,000 tons (metric). Is this an overestimate? It hardly seems so, for the present traffic in spite of the war exceeds 200,000 tons, and the progress accomplished in the period before the war is most encouraging, as is shown by the following figures:

1910	43,336	tons
1911	68,632	"
1912	98,536	"
1913	241,800	"

In value of merchandise the progress of the commercial movement is not less suggestive:

1910	24,310,000	francs
1911	41,915,000	"
1912	63,280,000	"
1913	79,371,000	"
1916	107,963,000[3]	"

The future of Casablanca is regarded with satisfaction by those who appreciate the importance of its situation on the Atlantic coast. When Casablanca is joined by rail to Tangier on the one hand and Oran on the other it will become a terminus of an Old World line to Central and South America—at least until the Trans-Saharan line reaches Dakar—for travelers who wish to shorten their journey by several days.

Besides the development of Casablanca the program of public works includes improvement of the local ports of Kenitra, Rabat, and Fedalah in the north, and of Mazagan, Safi, and Mogador in the south.

Rabat and Kenitra are neighboring ports, the former situated on the estuary of the Bu-Regreg, the latter 10 kilometers from the mouth of the Sebu. Both ports are closed by bars which permit only the passage of boats drawing three and a half meters. In each case a dredged channel will be protected by parallel jetties thrown out to sea. The case of Kenitra is especially instructive. This small port is a result purely of human determination. In 1912 it was nothing more than a *kasba*, or Moroccan citadel, lost on the desolate bank of the Sebu; it had not even a boat to suggest a port. But its situation and the even depth of the river attracted the attention of General Lyautey, and he conceived the plan of diverting to this point all the important commerce of the plain of Sebu and of Fez which, for lack of a natural outlet, had been directed northwards to the profit of the Spanish port of Larache.

[2] See the plan in the appendix to La Revellière: Les énergies françaises au Maroc, Paris, 1917.
[3] Figures for 1916 from H. Dugard: Le Maroc de 1917, Paris, 1917, p. 171.

FIG. 8

FIG. 9

FIG. 8—The Sebu near Fez, with one of the few bridges in Morocco. Difficulty of importing requisite material during the war has prevented bridge building from keeping pace with the notable progress in road building.

FIG. 9—A pioneer railway in Morocco. These narrow-gage lines (60-centimeter), primarily designed for military purposes, have been turned over to public service with much profit to commerce.

The works at the southern ports, Mazagan and Mogador, simply designed to furnish harbors for small sailing vessels, are practically completed. Farther south, however, pacification of the Sus has been too recent for the opening of a port at Agadir, though since 1917 the Department of Public Works has effected improvements for the better protection of the naval flotillas.

Five lighthouses of the first class have also been erected along the coast.

Roads

In the matter of railroad construction France was not free to follow her own bent. German jealousy had insisted on the addition to the treaty of November 4, 1911, of a clause requiring the international Tangier-Fez railroad to take precedence over other lines in the French protectorate. The restriction on railways, however, gave special impetus to road building, and this, with the introduction of the automobile, has proved one of the chief factors in the rapid opening up of the country.

The highway program of 1913 included a road system aggregating 2,500 kilometers. At the beginning of the war only 50 kilometers of metaled roads had been constructed; today 1,600 kilometers are open to traffic, and another 600 kilometers will shortly be ready. During the war no work has been pushed forward more vigorously, for, conformably with General Lyautey's original plan, road building serves the double purpose of economic development and pacification. For the most part it is carried on with the help of native labor, which is thus afforded an additional source of livelihood.

Part of the system, however, has not yet been completed for lack of special material. This is the case with the large bridges. With the exception of a stone bridge across the Sebu near Fez and an iron bridge across the Um-er-Rbia, the rivers have been bridged by temporary structures. In addition a considerable amount of work has been done in improving the native roads where the situation has not permitted regular road building. This work, executed in general by the army, again serves the double purpose of military and economic ends. To the 1,600 kilometers of regular highways may thus be added 2,000 kilometers of roads practicable for wheeled traffic.

Railroads

Reference has already been made to the restriction on railroad development. This has been particularly annoying in view of the impediments encountered in the Tangier-Fez project, difficulties in the way of surveys and preliminary work and in the formation of a Franco-Spanish company. The first sections were not contracted for till 1917. Work on the line has now begun. Its total length will be 310 kilometers, of which 210 lie in the French zone.

FIG. 10

FIG. 11

FIGS. 10 AND 11—The old and the new in Moroccan agriculture. To the primitive plow are harnessed any available animals—and even women. "It is not unusual to see a camel, an ass, and a woman drawing the plow," says Bernard ("Le Maroc," 1913, p. 170). The introduction of modern agricultural machinery is, however, beginning to transform Moroccan agriculture.

A system of commercial lines for the protectorate has now been elaborated; agreement for construction and exploitation has been drawn up between the protectorate and two large French companies and simply awaits parliamentary sanction. The gage will be standard (1.44 meters), and the length will aggregate 870 kilometers. It will unite all the large towns—Fez, Meknes, Rabat, Casablanca, Marrakesh (see map, Fig. 1).

But, while awaiting the great lines of the future, Morocco has not been absolutely deprived of railroad facilities. It possesses a system of so-called Decauville lines (60-centimeter gage), a construction not interdicted by the treaty convention. The first lines of this type were started in September, 1912, and rapidly pushed forward, until today they aggregate 850 kilometers. At first reserved for military purposes, the lines have been opened to the public for passenger and freight traffic since March, 1916. The promptness of commerce to profit by the facilities thus offered, in spite of the inevitably high price of transport, is proof of the country's progress, as is suggested by the following figures, which exclude military transport. For the year 1917 and on the system in western Morocco only (622 kilometers), the receipts were 4,296,000 francs; the number of tons of merchandise transported, 43,500; the number of passengers carried, 205,000.

Will the utility of this narrow-gage system disappear with the construction of the main railroads? No; for the most part it can be used to supplement them, serving the same purpose as local lines in relation to trunk lines.

The New Towns

The spontaneous birth and rapid growth of European towns in Morocco has placed before the protectorate a series of interesting problems that call for modern methods of solution.

The unrestrained tendency of the European town growing up beside the native town is to overshadow, to suffocate, and finally to replace its victim. To avoid this unfortunate sequence General Lyautey has laid down an absolute rule that the native and the European towns shall be separated, a plan adopted by the English in India. The policy is in accord with moral and hygienic principles. In an intimate mixture of two such dissimilar civilizations it is rather the vices than the virtues that flourish. On hygienic grounds the European should take up his residence away from those centers of infection, the Moroccan towns, with their narrow, dirty, ill-ventilated streets.

In the town plans of the future the first care will be to set aside a strip of ground separating the European and native sections, and on this strip all building will be prohibited. The work involved in such town planning is arduous and detailed; it calls for the imagination and taste of the artist, the science of the architect and the sanitary engineer. Its direction has

been entrusted to a specialist, M. Prost, who lately drew up the plans for the extension of the city of Antwerp. The task, formidable enough when dealing with an entirely new town, is much more complicated in the case of a half-built town such as Casablanca, where construction proceeded in a haphazard manner at the hands of speculators in the first days of the protectorate. Established interests must also be taken into account. At present plans for the extension of the chief towns of Morocco—Casablanca, Rabat, Fez, Marrakesh,[4] Meknes—are practically ready, and some of them have already been announced. These prohibit all building within the

FIG. 12—The well, *noria*, of a Moroccan farm.

limits of the future city that does not conform with the established plan.

To enforce the execution of these plans special legislation has been necessary. A law of expropriation establishes the maximum value of the remaining lands for the calculation of indemnity. Another new measure—and a very advanced piece of legislation—provides for the formation of syndicated associations of proprietors. This permits the grouping of the neighboring proprietors of the same parcel of land for a redistribution of the land among themselves in a manner more conformable with the general interest. The experience gained in the preparation of these plans of extension and of the syndicated associations should furnish useful data for the recon-

[4] For an account of the building of a European town, as exemplified at Marrakesh, see Georges Aimel: Le Guéliz-Marrakech: Naissance d'une cité au Maroc. *France-Maroc*, March, 1919, pp. 60-63.

struction of the towns and villages in the devastated area of northern France.

Agriculture

Morocco, like Algeria and Tunisia, of which it is the continuation, is above all a country of agriculture and stock raising. The Atlantic littoral, where the humid oceanic climate prevails, especially offers lands of remarkable productivity. It is difficult, however, to estimate the exact extent of these fertile lands. The total area of French Morocco is 42,000,000

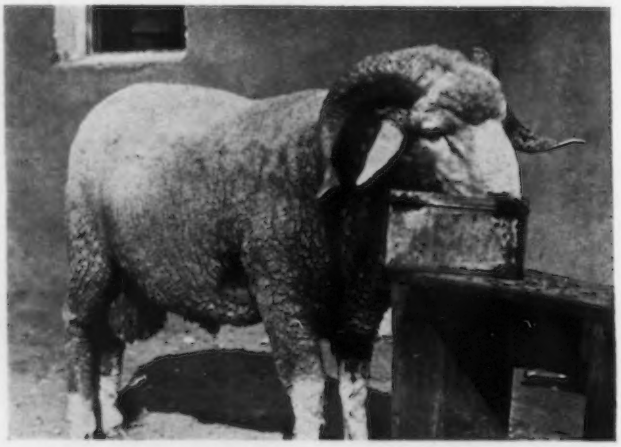


Fig. 13—A ram of Tadla, merino type. Sheep rearing in Morocco has a great future. The merino, appreciated for its fine wool and delicate meat, appears to have originated here.

hectares, but this includes vast desert stretches unavailable for cultivation, at least under present conditions. Such are the plain which extends to the south of Marrakesh, the plateaus of Tafilelt, and the dunes on the Algerian boundary. The extensive mountainous areas of the Middle Atlas and the High Atlas and the forest and marsh areas must also be deducted.

The regions most favorable for cultivation are the plain of the Shawia around Casablanca, that of the Gharb to the north of Kenitra, the valley of the Sebu (plain of the Beni-Mtirs), the Dukkala south of Mazagan, the Abda about Safi—all these in western Morocco; in eastern Morocco are the plains of Trifa and Angad.[5]

In these plains, distributed in patches, occurs the famous *tirs*, an argillaceous black earth resembling the *chernoziom* of Russia. Unworkable during the rains, cracked and parched during the dry season, and demanding much labor, the *tirs*, rich in potash and nitrogen, is yet possessed of

[5] On the zones in relation to climate see A. G. Ogilvie: Morocco and Its Future, *Geogr. Journ.*, Vol. 39, 1912, pp. 554-575.

a marvelous fertility. It is especially adapted to cereal cultivation—wheat, barley, maize, and sorghum being the chief crops produced thereon.

The native Moroccan cultivates *in extenso*, tilling the lands easiest to work in a superficial fashion with the most primitive of appliances. The wooden plow that he uses only scratches the soil to a depth of six or seven centimeters. He never manures his land and knows nothing of the rotation of crops. Each year he chooses a new field, allowing last year's to remain fallow. The harvest is reaped by sickle or knife; animals tread out the grain from the chaff, which is winnowed by the wind.

FIG. 14—An Indian zebu. The Indian zebu has been introduced into Morocco for crossing with native cattle, an experiment that has proved successful in Algeria, Tunisia, and Senegal. This is one of the ways in which the Agricultural Service created by the protectorate is endeavoring to effect improvement. Morocco has always been pre-eminently a pastoral country, but under indifferent handling most breeds of stock had deteriorated.

France seeks to bring about improvement of these primitive methods by education and supervision, all the while guarding against too abrupt a change of the ancient ways. Little by little the native adopts modern methods and equipment. A certain number of European colonists—there were only 200 before the war because of the difficulty of purchasing land and the uncertainty of title—scattered through the agricultural districts furnish examples of modern agriculture. Already agricultural machinery, including even motor tractors, is employed by some of the natives. The kaids of the Shawia, for example, have bought harvesting tractors for their properties.

To afford more direct assistance to the native the protectorate has established "Sociétés Indigènes de Prévoyance," which, provided with a small capital, buy selected seeds to advance to the native cultivator. The plant species cultivated in Morocco are in general of very poor quality. Before

the coming of the French all the wheat grown was of the hard variety unsuitable for making flour: the soft variety has now been introduced. In respect to other cereals and vegetables and fruit trees the Sociétés de Prévoyance have also replaced the existing kinds by better varieties yielding a larger return. Agricultural experiment stations are working along this line to determine the species best adapted to soil and climate and are also trying out results with a number of plants not yet acclimated in the country.

Similar methods are being employed for the regeneration of the animal species and for better practices in stock raising. Morocco is rich in cattle, asses, mules, horses, and especially in sheep, of which the flocks are estimated at 20,000,000 head. But no care is given to the stock; there is no shelter against inclement weather; provision of forage is unknown, although the flocks become greatly emaciated during the dry season and epizoötic disease is rife.

The French stock breeding service strives patiently against these bad conditions. It offers bounties for breeding; it has taken up the question of water supply and has sunk wells in the pastoral regions. Great help is given by the traveling veterinary inspectors, who visit the markets and *duars*, even going into the unpacified regions and gratuitously giving advice on the care of the stock.

Experimental farms, such as that of Fez, complete this work of agricultural education. Mention, however, should also be made of the steps taken to revive certain abandoned crops of much importance, such as the mulberry and cotton. Imported cotton goods have now replaced the native industry, and, with the exception of rare fields in the Sus, cotton cultivation has been abandoned. But there are hopes of resuscitating it. Experiments already made give promise for the future. Success will depend especially on irrigation facilities, an abundant labor supply, and cheap transportation; these conditions have not yet been realized in Morocco.

Colonization

In Algeria the government had adopted the *cantonnement* system, by which the tribes were relegated to territories judged sufficient, and the rest of the country was given over to colonization.

Such a measure would not be in accord with French policy in Morocco, with its respect of native rights. Beyond direct purchase of land from the natives, territorial opportunities for colonization are sufficiently limited. These include the lands of the Makhzan, that is the domain of the Sherifian Empire, not all of which are as yet available, though within the last year several important tracts have been opened for colonization. Outside of the domanial lands there are the collective lands of the tribes, of which, according to a recent law, portions unrequired may be alienated by the tribal assemblies. At present the chief obstacle to European ownership in Morocco

comes from the traditional system of landed property. In the midst of the extreme complications arising from claims to the same piece of land, it has proved difficult, if not impossible, to verify the title of the would-be vendor. At the same time there has ensued interminable litigation, as there is in the Mohammedan law no provision for the extinction of titles.

FIG. 15—The cedar, "sultan" of the Moroccan forest. Trees three to four hundred years old, 35 to 40 meters in height and 5 to 6 meters in girth, are not rare (Piquet: "Le Maroc," 1917, p. 58). The cedar forests cover great extents of the Middle Atlas at elevations between 1,100 and 2,300 meters.

Since 1913, however, there has been in force a law (*dahir*) instituting a new régime. All existing owners and all new purchasers of land can register their property, that is to say record it in the special land registers (*livres fonciers*). The administration then makes an examination of the property and a definition of its boundaries, operations accompanied by the widest publicity. If no protest is made during the six months follow-

ing registration, the title of the property is assured. If any counterclaim is raised, the tribunal decides between the claimants, and only after decision does the title become valid. Inscription in the land registers annuls all former titles; this is the land statute of the new régime.

The Forests

The forest resources of Morocco are very important. Three great zones may be distinguished. First there is the zone of the cork oak, which extends over an area of some 250,000 hectares, chiefly along the littoral. The most important forest of this type is the Mamora Forest, occupying 135,000 hectares to the north of Rabat. From the beginning the protectorate has taken measures to preserve these forests against the destructive operations of the natives, who do not use the cork but wastefully strip the tree to reach the underlying layer, from which tannin is extracted. The forest service has further opened ways of communication, dug trenches against fire, and built houses for the foresters. It has commenced a methodical exploitation of the Mamora Forest which, it is estimated, will furnish 100,000 quintals of cork a year.

The next zone, that of the cedar, is still more extensive; but this admirable tree, "sultan" of the Moroccan forest, is found only in the Middle Atlas at an elevation of over 1,300 meters. Not all the territory covered by this forest has been pacified, but the surface already known to be so covered surpasses 300,000 hectares, says M. Augustin Bernard.[6] The cedar forest, tall, green, and sunlit, with its unfamiliar beasts, its singing birds, its abundant waters well stocked with fish, is one of the most beautiful and interesting regions of Morocco. The tourist of the future will there enjoy some of the rarest pleasures that nature affords. These forests of the Atlas, many centuries old, were in great danger of perishing when France established her protectorate. The native woodsmen, for lack of proper implements, were in the habit of setting fire to the base of a tree to bring it down, and thus an entire section of the forest was often sacrificed. The forest service has taken the native woodcutters into its employ. A commencement has been made by disposing of the dead and fallen trees. The exploitation from this category alone has produced more than 3,000 planks (*madriers*) a month.

Lastly there is the zone of the *argan*, occupying over 200,000 hectares of the coast region south of Safi. The *argan*, peculiar to Morocco and the Canaries, appears to be the last vestige of a vanished tropical vegetation.[7] It is valued for its oil-yielding fruit, and its conservation in this arid region is likewise desirable from the point of view of the climatic advantages of a forest cover.

[6] *France-Maroc*, December, 1917. See also Boudy: Les Forêts du Maroc, *ibid.*, May, 1919, pp. 113-119.
[7] L. Gentil: Le Maroc physique, Paris, 1912, p. 283.

Mineral Wealth

The Moroccan subsoil is still little known. Its reputation of richness in all kinds of mineral wealth came from the notorious Mannesmann brothers, who saw therein a means of drawing German interests to Morocco. In reality serious prospecting has scarcely been possible until the present time, and the mountain regions, where the presence of important deposits may most reasonably be expected, are not all open to free movement. The High Atlas still keeps its secrets; occasional travelers have noted the presence of lead, copper, and zinc; but no definite knowledge exists.

Fig. 16—Tabular cedars in a wood of holm oak, Middle Atlas.

The only positive information that we possess at present relates to the phosphate beds of El-Borudj, at the head of the Tafilelt, analogous to the famous deposits of Gafsa in Tunisia and the valuable Algerian deposits now on the point of exploitation; the manganese deposits of eastern Morocco, exploited during the war; the iron of Camp Boulhaut, near the coast between Casablanca and Rabat, still in the course of investigation; petroleum, of which there are many indications in northern Morocco and to the examination of which a special mission has been detailed. Bituminous schists, salt, gypsum, and slate also exist.

The mining law of Morocco has been in force since January, 1914. Persons of all nations have equal prospecting rights. Each discoverer, of whatever nationality, can be assured of the ownership of his discovery if he obtains from the administration a permit for search. A permit is good

for three years and secures ownership over the area designated by payment of a tax. Before the war an international jurisdiction, the so-called "Arbitral Commission," including representatives of all the interested nations and presided over by a Norwegian magistrate, adjudicated the claims of discoverers. Unfortunately the commission had scarcely begun to operate when the war broke out; hence the disposition of certain claims still remains unsettled. A law recently passed will permit resumption of the work of this commission, with the safeguarding as far as possible of the rights of foreigners who cannot be informed.

FIG. 17—The ruins of Volubilis. Fifteen centuries of "Barbary" have not yet effaced the traces of Roman occupation. Much of the material of Volubilis has been used in the building of Meknes, some distance to the south.

PUBLIC HEALTH AND MEDICAL ASSISTANCE

Hygienic and medical aid is the most certain and undoubtedly the most beneficial means of influencing the natives. Not only is it a humanitarian duty; the preservation and physical improvement of the race are also efficacious means of promoting French interests. Notably, the question of labor, vital in the development of new countries, is intimately related to the question of hygiene, especially of infant hygiene. As soon as a new post is established the army physician attached to the post opens a consulting room. He draws thither the native and thence exercises a supervision over the health of the region. As soon as means permit he adds to the consulting room a native infirmary more or less complete according to the importance of the post.

The posts are grouped by regions, and each region possesses its complete sanitary service for the natives, with separate buildings, operating and dressing rooms, kitchens, baths, etc. Some of these establishments have grown into regular modern hospitals, such as the Hôpital Mauchamps at Marrakesh and the Hôpital Cocard at Fez.

The primary element of this organization is the "mobile medical unit,"

a sort of perambulating dispensary, consisting of a physician, two attendants, and four guides with mules. This unit goes everywhere in the mountains, even among the unsubmissive tribes, to visit infected villages and suspected markets. It distributes quinine and gives consultations, dressings, and vaccinations. It is the genuine symbol of French work in Morocco. The work is strongly supported by the protectorate, which has lately introduced the automobile and the *camionnette* ambulance into these medical units.

To these organizations must be added the provisions for the health of

FIG. 18—The ruins of Shella, a "solitude of melancholy charm" (Tissot, *Bull. Soc. Géogr. de Paris*, Vol. 12, 1876, p. 273). Practically nothing remains of the Roman town (Sala Colonia). The present ruins are of the Shella that rose to magnificence in the late twelfth century under El Mansur and was restored and used as a necropolis by the Beni Marin Sultans, since when until very recently Mohammedan fanaticism forbade the place to Europeans.

Europeans—provisions especially important in the towns—in the form of dispensaries and consulting services and hospitals, most commonly connected with the army hospitals.

Prophylactic measures are peculiarly urgent in Morocco, as in all Mohammedan countries, where lack of cleanliness and over-crowding occasion violent epidemics. Their organization and enforcement have been confided to the bureaus of health established in the towns. Particular care has been devoted to the organization of special therapeutic measures against syphilis, malaria, affections of the eye, and the gastro-enteric affections that work such havoc among children. To control syphilis, the curse of the Arab race, five great clinics have been established, and the most modern methods have been applied with a success that has brought them great renown among the natives.

EDUCATION

Formerly education in Morocco was of a purely religious character. In the primary schools it was sufficient for the pupils to learn to chant

the Koran by heart. Even the highest education, that given at the Karuyin mosque of Fez, which still plays the rôle of university among the countries of Islam, was based entirely on theology; the sciences had no place, save astronomy; all studies bore directly on the interpretation of the sacred text. France has respected this religious teaching; she has only added to it. For primary instruction there are the Franco-Arabic schools, where the native youth of its own free will comes to learn French, the three R's, and some vocational subjects. The schools in no wise meddle with the religious traditions or customs of Mohammedanism, but they give the scholars some acquaintance with modern commercial methods and an understanding of the economic conditions in which French occupation of the country has placed them. The schools also give evening instruction to adults who wish to learn French. The instructions given to the new directorship of education by General Lyautey in 1913 called for the immediate opening of such schools in the *bled* wherever a sufficient number of pupils could be gathered together.

Today these Franco-Arabic schools, which, furthermore, are always well attended, number nearly a hundred. Some of them, such as the cabinet-making school of Salé and the accounting school of Fez, have almost assumed a professional character.

The secondary instruction established by the protectorate includes the Mohammedan colleges at Fez and Rabat, where the sons of the Moroccan bourgeoisie, previously prepared in special schools, are trained for positions in native administration. The courses of instruction, given in Arabic by professors who are French for the most part, deal with Arabic grammar and literature, the history and geography of Morocco and France, arithmetic, and the usual scientific subjects.

Crowning this organization is the "École Supérieure de Langue Arabe et de Dialectes Berbères" at Rabat, which has become a center of linguistic studies and the training school of European and native administrators.

The advanced instruction given in the Karuyin mosque has not been touched save for an administrative reorganization, which has created a council of professors (*ulemas*), and the furnishing of material resources that were previously lacking.

Quite distinct from the Mohammedan schools are the Jewish schools which had been organized before French occupation by the remarkable efforts of the Universal Hebrew Alliance. These schools, at present thirty-five in number, give instruction in the ordinary subjects and in the French language, a circumstance that has greatly assisted the propagation of French influence.

Europeans also find in Morocco the various grades of primary and secondary instruction that obtain in France: primary schools in the towns, an upper primary at Casablanca, secondary schools for boys at Casablanca and Rabat, and a secondary school for girls at Casablanca.

Art in Morocco

The liberal spirit of a protectorate is nowhere better attested than in its attitude toward the native arts. Its works of art reveal the truly original character of a race: by its esthetic creation it manifests its vitality.

The Moroccan terrain is strewn with ancient ruins. There are such vestiges of Roman domination as the scattered stones near Meknes that mark the site of Trajan's city of Volubilis. The work of excavation and of recovery of inscriptions was deemed by General Lyautey a labor not

Fig. 19—Bab-el-Mansur, the gate of Mansur, is one of the most imposing monuments of Meknes. The ornamentation is in brilliant faience; the marble columns are of material probably brought from Volubilis.

unworthy of soldiers, even in war time; and on this task German prisoners especially were employed.

Moroccan art proper begins with the dynasty of the Almohades in the second half of the twelfth century. Monuments of their rich but restrained art survive in the three slender carved towers, the admiration of all artists—the tower of Hassan at Rabat, the Kutubiya at Marrakesh, and the Giralda of Seville. Under the Merinides (Beni Marin) Moroccan art attained its apogee. Their style, richer and more elegant than the art of their predecessors, is preserved in the incomparable monuments of the *medersas*, or colleges of the students, of Fez. In the *medersas* a supreme artistic effort has been realized in the resplendent interiors, where are found united all the resources of the minor arts of ornamentation, of

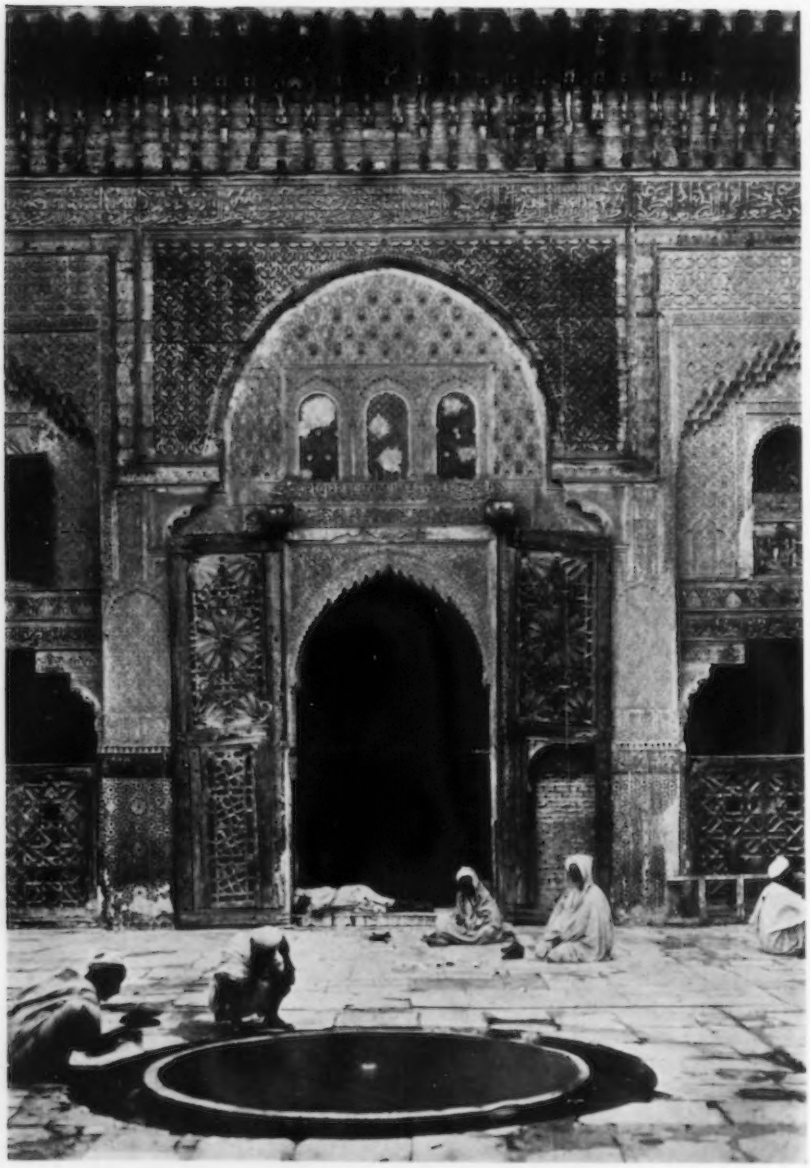


FIG. 20—Court of the *medersa* (college of students) Buananiya at Fez, an eloquent expression of the Moorish art of ornamentation.

mosaic, and of stucco. These monuments, previously unknown to students of art, were discovered five years ago in a discouragingly ruinous condi-

tion; the *zelliges*, or mosaics, of the Middle Ages were half gone; the stuccos and wood inlays were crumbling to dust.

The first care was to see whether there still existed in Fez any artisans who preserved the old traditions. Happily such were found. France took them into her service, putting them under the direction of authorities well

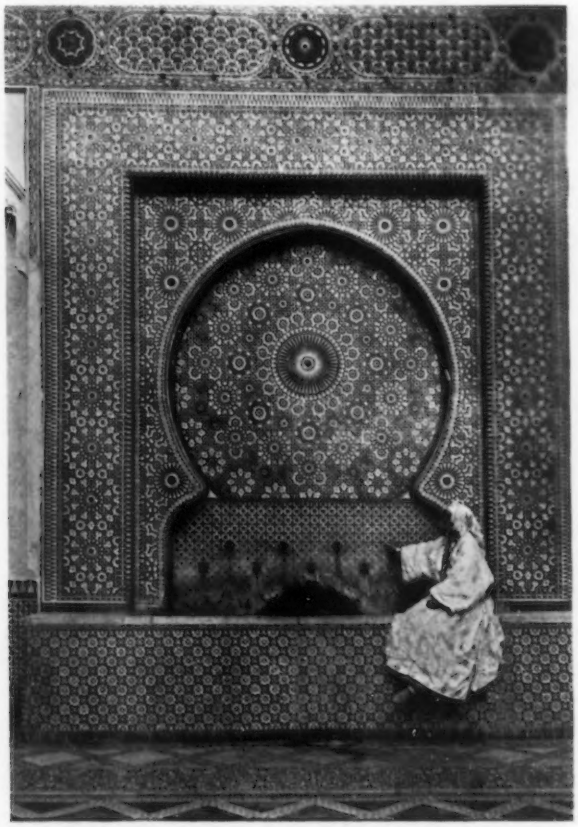


FIG. 21—A fountain in Fez.

acquainted with the beautiful models of Arab art. She also assured them pupils and charged them with reviving traditions fast being forgotten; thus she has been able to restore monuments of an art which by reason of Arab indolence would have perished in another fifty years.

These monuments, these artistic traditions still revealed in the mosques, the palace, and private dwellings give the towns of Morocco, particularly Fez and Marrakesh, a special attraction for the tourist. There, among these medieval crafts, customs, and political organizations, one is trans-

ported back to the Middle Ages. Morocco is one of the few countries of the world which has not been touched by modern civilization until recent years.

Besides the artistic beauty of the towns and the picturesqueness of the extraordinarily intense life circulating in their narrow, crooked streets,

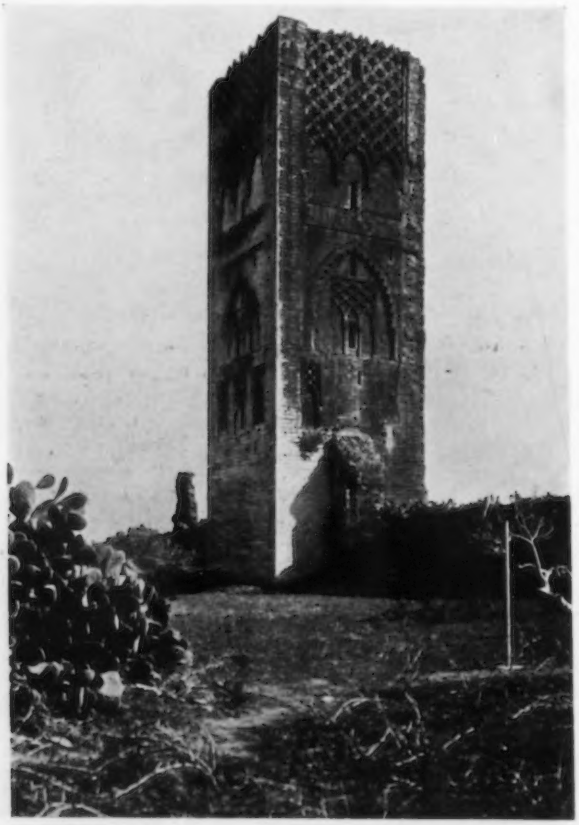


FIG. 22—The tower of Hassan outside Rabat. Town and tower were built by the Sultan El Mansur. The tower, 45 meters high, beautifully ornamented with fretted stone work, is sister to the towers of Giralda at Seville and Kutubiya at Marrakesh. They survive as admirable examples of early Moorish art.

Morocco possesses the potent attraction of the *bled* and of the desert with its far horizon, the luxuriant palm groves, the beautiful gardens of Marrakesh and Sefru, and not least the great cedar forests of the Atlas. These forests General Lyautey has decided to set apart as a national park, after the fashion of the United States.

Summary and Conclusion

The rapid development of French Morocco in spite of the war is shown by the annual statistics. The figures for the combined import and export movement are:

1911	139,698,000	francs
1912	177,737,000	"
1913	221,607,000	"
1914	163,999,000	"
1915	235,940,000	"
1916	310,854,000	"

A faithful mirror of prosperity is seen in the finances of the country. The Moroccan budget shows a growth unique in French colonial history.

	Expenditure		*Receipts*	
1913-1914	21,663,000	francs	15,925,000	francs
1914-1915	29,255,000	"	21,776,000	"
1915-1916	38,925,000	"	46,086,000	"
1916-1917	32,153,000	"	58,485,000	"

How can this growth be explained? The writer does not hesitate to say that it is because France has entrusted the country to a man of courage and vision. Timidity and economic parsimony have hindered her colonial policy in the past. To his office General Lyautey has brought something of the spirit of the Roman proconsuls who, looking to the future, built with celerity an enduring edifice.

To start Morocco on its future career General Lyautey has provided a port adequate for the maximum demands, roads and railways equal to the requirements of a large traffic, plans for extension of the great cities to be executed as need arises. To save the country during the crisis of the war he has not hesitated to engage the funds of the Moroccan loan and to multiply the public works, schools, hospitals, administrative and military buildings. And in the midst of the war he has ventured commercial undertakings, expositions, and fairs whose example has been followed by Paris and Lyons.

Such lavish expenditure is in reality economic wisdom. The millions of the Moroccan loan expended to save the country during the war are all to the advantage of its future development. Is it not a profitable sacrifice that results in the sparing of immense resources, the conservation of valuable properties for which France is responsible? General Lyautey's policy, furthermore, has enabled Morocco to make direct contribution to the national defense of over 30,000 native soldiers and several million tons of wheat, maize, and sorghum, without counting wool, hides, and skins.

Yet, however bold and optimistic this method, it would be open to failure if not based on a deep and essential liberalism. The secret of French influence in Morocco and of France's policy with the natives lies in the constant effort to approach the native spirit, in scrupulous regard for the native

beliefs, manners, and customs. The sincerest homage to France's liberalism is rendered by the people of Morocco themselves, who, once having accepted her tutelage, have no desire to withdraw from it but continue to accept of their own free will the intervention of which they were formerly defiant. Once won over to peace and put in the way of profitable trade, they have no desire to return to their former warlike and poverty-stricken life.

This implies that respect for native tradition does not exclude introduction of changes necessary to put this people in the way of modern life. To introduce new methods appeal must be made for co-operation on the part of the natives. In whatever is done in the way of agricultural development, colonization, public work of any sort the native must be associated with the government to mutual advantage. Such collaboration, the final goal of French policy in the protectorate, is likewise the object of certain recent reforms in Algeria.

The conception was nobly expressed by General Lyautey on a recent occasion, the obsequies of Colonel Berriau, one of the chief builders of this policy:

> He was not one who looked back: his gaze, prudent and wise, was on the future. This country, whereon we have so prodigally lavished our blood and our gold, was to him no field of exploitation, no reservoir of resources to be merely tapped for our benefit. In his regard this people, who have given such proofs of loyalty and of devotion, who bring such qualities of intelligence and service, have an unalienable right to participation in all its benefits. And this, the doctrine of the protectorate, is the political and social doctrine of the highest morality—the rights of all peoples, of which today we are the standard bearer for the world.

CZECHO-SLOVAKIA AND ITS PEOPLE*

By MILIVOY S. STANOYEVICH

The aspirations of the Czecho-Slovaks to be regarded as a distinct people, with national traditions and ideals peculiar to themselves, have been formally acknowledged by most European states. Their claims are incontestable and are only disputed by those who fail to distinguish between what is meant by self-determination and the question whether or not a nation is fitted to take charge of its own destinies. Few people in Europe have proved more resistant to efforts toward assimilation than the Czechs and the Slovaks, who have suffered the double disadvantage of forming part of a corrupt and stagnant empire. They have been cut off during the past three hundred years from all contact with Western Europe and have lived in a constant state of instability and insecurity on the very fringe of that empire, which, though strong enough to encompass them, was not strong enough to subdue them. After the centuries of sufferings under foreign domination, the race which gave birth to Huss, Comenius, Kollár, and Palacky, and which has justly earned a reputation for courage, industry, and integrity, has come into its own.

Unity of the Czechs and the Slovaks

The Czecho-Slovaks, or Čecho-Slováci,[1] as they are proud to call themselves, live in a compact mass in Bohemia, Moravia, Silesia, and Slovakia, from the Böhmerwald on the west to the Danubian city of Pressburg on the south and to the upper Tisza on the east (see map, Fig. 1). There are about 12,000,000 of these people altogether. This extensive region, about the size of the state of Pennsylvania, is, as a whole, mountainous, except for the Danube plain, and is richly endowed with forest. This forested mountain land offered to the Western Slavs a natural refuge against the invading hordes of Magyar, Mongol, or Turk, which, throughout the centuries, swept across the great, open Hungarian plain of the Alföld only to be halted by this obstacle in their onward sweep.

Under pressure of invasions from without, the Slovaks of northern Hungary and the Czechs of the Bohemian plateau were thrown together

*In the present article and on the accompanying map (Fig. 1) names are spelled in the Czech form. As to pronunciation: with the exceptions noted, vowels are pronounced as in Italian and consonants in general as in English. The exceptions relate mainly to letters distinguished by diacritical marks. These are: ě=ye, ů=oo; j=y, ň=ny (Spanish ñ), c=ts, č=ch, š=sh, ž=zh (French j), ř=rsh, ch=kh (German and Scotch gutteral ch).—Edit. Note.

[1] In English the name Czech (pronounced Chek) is generally written in this, its Polish form (in Bohemian, Čech). It is probably derived from the name of the first leader of the Bohemian people. Now this name signifies an inhabitant of Čechy, the native designation of Bohemia, the Bolan land. The Slovaks (Boh. Slovák, plur. Slováci, originally meaning Slav) speak practically the same language, i. e. a dialect of the Czech, as the Walloon of Belgium is a dialect of French. (See Louis Leger: La liquidation de l'Autriche-Hongrie, Paris, 1915, p. 26).

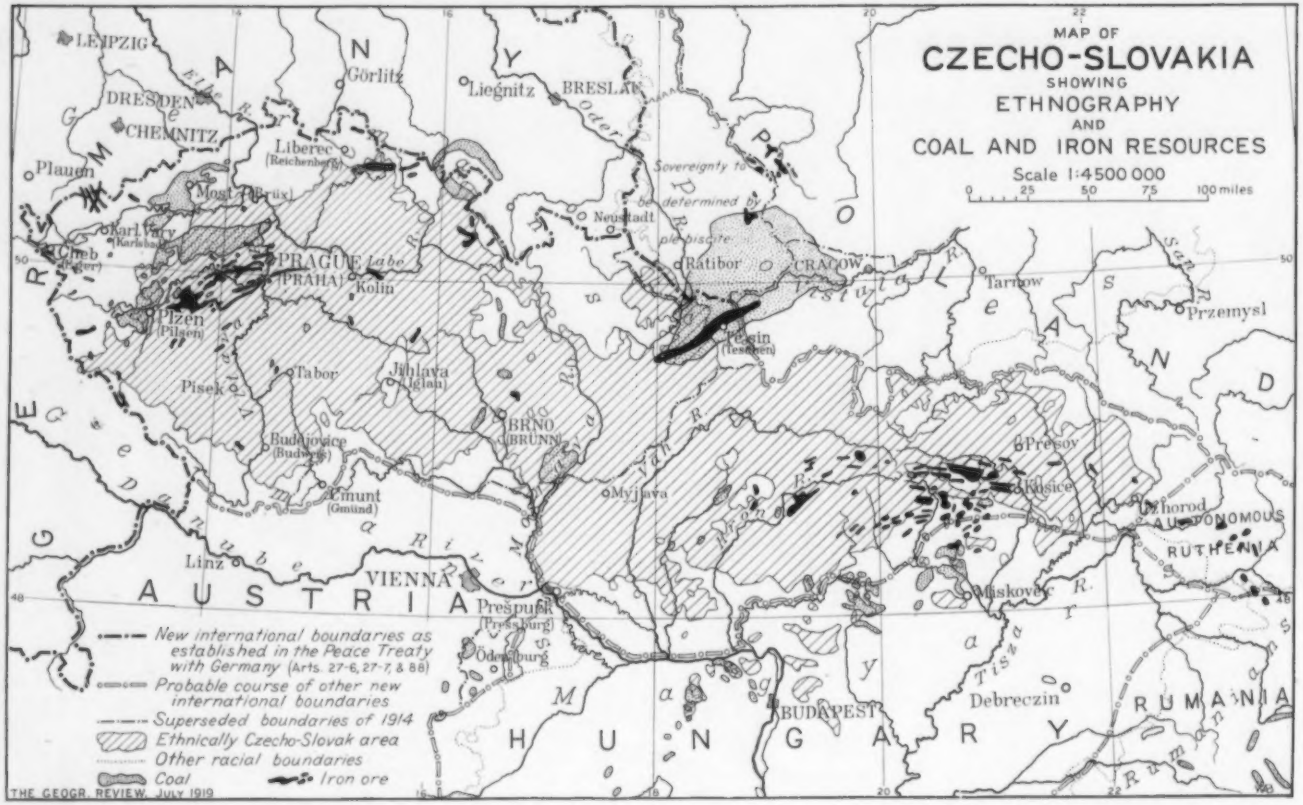

MAP OF
CZECHO-SLOVAKIA
SHOWING
ETHNOGRAPHY
AND
COAL AND IRON RESOURCES
Scale 1:4500000
0 25 50 75 100 miles
LEIPZIG
DRESDEN
CHEMNITZ
Görlitz
Liegnitz
BRESLAU
Plauen
Liberec (Reichenberg)
Most (Brüx)
Karlsbad
Cheb (Eger)
PRAGUE Labe
PRAHA
Kolin
Plzen (Pilsen)
Pisek
Tabor
Jihlava (Iglau)
BRNO (BRÜNN)
Budějovice (Budweis)
Gmünd
Linz
VIENNA
AUSTRIA
Přešpurk (Pressburg)
Ödenburg
BUDAPEST
HUNGARY
Sovereignty to be determined by plebiscite
Neustadt
Ratibor
CRACOW
Teschen (Těšín)
Tarnow
Przemysl
Prešov
Košice
Užhorod
AUTONOMOUS RUTHENIA
Mukačevo
Debreczin
RUMANIA
New international boundaries as established in the Peace Treaty with Germany (Arts. 27-6, 27-7, & 88)
Probable course of other new international boundaries
Superseded boundaries of 1914
Ethnically Czecho-Slovak area
Other racial boundaries
Coal
Iron ore
THE GEOGR. REVIEW, JULY 1919

FIG. 1

and shared a mutual life, especially since the rolling Moravian country constituted no barrier. They had the same language, the same interests, the same enemies, and the same religion. In fact the only obstacle to their unification was the policy carried out by the Austro-Hungarian monarchy. But to understand better the claims of the Czecho-Slovaks, the elements of their history should be briefly reviewed.

History of Bohemia

After the rise of the Holy Roman Empire, which, in the name of the Roman Catholic Church, Germanized the Slavs of Central Europe, Bohemia succeeded in maintaining her national integrity and Slav character under the rule of her native princes. In the eleventh century the independence of Bohemia as a kingdom was recognized by the Roman emperors, and the kings of Bohemia became electors of the Holy Roman Empire. In the thirteenth century the Bohemian King Přemysl II began aggressive warfare against Rudolf Hapsburg, which ended in his own defeat.[2] Rudolf's position was thus strengthened to such an extent that he became emperor of the Holy Roman Empire and laid the foundations of the Austrian Empire. During the fourteenth century there arose a movement in Bohemia against the luxury and demoralizing influence of the Catholic Church and of the emperor personally—a movement directed toward a purification of life and morals. John Huss, head of the University of Prague and a disciple of John Wiclif, became the exponent of this new doctrine, which opposed the authority of Rome. This movement was in reality the germ of the Reformation. The burning of Huss and his friend Jerome of Prague by the Council of Constance, with the silent consent of the Emperor Sigismund, was the cause of the Hussite wars, those implacable struggles of the Czech nation against the Holy Roman Empire and the Latin Church.[3] The battle of the White Mountain (Bilá Hora) in 1620 wiped out the Bohemians as a nation and almost exterminated them as a people. The Hussites also disappeared as a political power but continued to exist as the Bohemian Brethren. Later they were included in the more general name of "Protestants" borne by the adherents of the Reformation.

The religious wars had weakened Bohemia to such an extent that she was obliged to recognize the Hapsburgs as her rulers. The despotic rule of the Austrian emperors led to many rebellions and revolutions in the seventeenth and eighteenth centuries, but they were always suppressed by terrorism and persecution. In such acts of oppression the Hapsburgs were assisted by the Jesuits, who took revenge on the "heretic" Czech nation by burning hundreds of thousands of Bibles and religious works written in the vernacular. It seemed at one time as if both the nation and its language

[2] See Ottův: Slovník Naučný, Vol. 6, p. 215, 1893.

[3] The Hussite wars lasted for many years. When they were finally brought to an end, the Czechs found that they had lost 2,200,000 men. (Cf. "Czechia i Czechi," *Russkaya Resyeda*, 1896, January, p. 107; cf. also E. Denis: Huss et la Guerre des Hussites, Paris, 1878.)

were destined to be exterminated under the Germanizing system of the foreign rulers.

The Czech Renaissance

But in the beginning of the nineteenth century there came about an entirely opposite result, namely the revival of the national consciousness of the Czech nation. It was due partly to the humanitarian revolutionary movement that spread from France over all Europe and partly to the efforts of a few Czech and Slovak patriots to revive the almost forgotten Czech language and literature. Jan Kollár (1793-1852), a scholar and poet, was the first to seek to inculcate in the Slavs the sentiment of Pan-Slavism. He compared the Slavonic culture to dawn; the German culture, to day; the English, to midday; the French, to afternoon; and the Spanish, to night.[4] His collection of poems "Daughter of the Slavs" (Slávy Dcera) inspired the Slavonic race with great hope and confidence. It is regarded as the gospel of Pan-Slavism. Another Slovak who played a great rôle in the revival of Bohemia was Paul Josef Šafařík (1795-1861), author of "Slavic Antiquities" (Starožitnosti Slovanské), "Slavic Ethnography" (Slovanský Národopis), and numerous philological works. The third member of the triumvirate of the Bohemian renaissance is František Palacký (1798-1876), author of "The History of the Bohemian People" (Dějini Narodu Českeho), a work based on wide research into original sources. He is the greatest of the Bohemian historians, and the Czechs call him "Otec Naroda" (Father of the People).

The Continued Struggle Against Austria

The iron despotism of Metternich and the Hapsburgs utterly failed to stop the revival of Bohemian literary, social, and political life. The new generations, with L. Stúr, K. Havliček, Svatopluk Čech, Jaroslav Vrchlický, Masaryk, and Kramař as their leaders, continued the struggle of their predecessors against the Hapsburg rule, or rather misrule. To reconcile Bohemia with Austria was the work of a Sisyphus. The Czecho-Slovaks were deceived by the Austrian statesmen not once but many times. They have often been imposed upon by the emperor himself. That is the reason why they never gave up the struggle all through the reign of Francis Joseph. But it is necessary to add that throughout the war they still persisted in supporting their juridical case. It was in view of this case that the Reichsrat was convoked on May 30, 1917, for the first time during the course of the war. On that occasion the Czech deputies solemnly proclaimed the independence of their country. It is by virtue of this juridical case that similar proclamations have been made since that time, at every sitting of the Reichsrat. The united Czech parties declared before the entire world that they accepted this program. The most resounding

[4] That is, the past of Europe belonged to the Latins, the present belongs to the Anglo-Saxons, and the future will belong to the Slavs.

acclamation of these ideas took place in Prague, when the Czech deputies of the Reichsrat and the Diets, finding themselves in accord with the Slovaks of Hungary, came together on January 6, 1918, in a Czech constituency and voted a declaration to this effect. Such a declaration had been violently suppressed by the Austro-Hungarian government. The Austrian government, however, was not able to put down the determination to act expressed by those Czecho-Slovaks who remained outside the Hapsburg monarchy.

The Recent Declaration of Independence

On October 18, 1918, the Bohemian National Council, recognized by the Allied and American Governments as the Provisional Government of the Czecho-Slovak state, issued a new declaration of independence signed by Professor T. G. Masaryk, as Prime Minister and Minister of Finance, General M. Stefanik, Minister of National Defense, and Dr. E. Beneš, Minister of Foreign Affairs and the Interior. This declaration was issued simultaneously in Paris, London, Rome, and other European capitals, and in New York.[5] Its significance consists in the fact that it influenced the other Slavs, especially the Yugo-Slavs, to resist the Austro-Hungarian Empire and to accelerate its dissolution. The acceptance of the terms of the armistice, as framed by the Allies, meant the fall and the dismemberment of the Dual Monarchy. What the future will be of this former mighty empire, which is now a small mid-European state, will depend largely upon the effectiveness of the League of Nations.

Future Prospects as Based on Economic Resources

As to the Czecho-Slovak republic, its future will depend on the skill with which its boundaries are drawn. Expediency, and not strict justice, has always ruled the decisions of the Great Powers, who are the final court of appeal in such matters. But if a mistaken idea of what seems to be the easiest way is allowed to prevail, and if the land greed of the neighboring states is permitted to supplant the claims of natural and ethnical frontiers, then the Central European question, far from being settled, will only be directed from Scylla toward Charybdis.

Provided Czecho-Slovakia is assured the possession of the geographical and ethnographical frontiers that are her due, she has no reason to despair of a prosperous and even brilliant future. The Czecho-Slovak has many of the sterling qualities that make for success. He has known how to utilize the resources with which nature has lavishly endowed his country. Agriculture is highly developed. Oats, rye, barley, wheat are the chief grain crops. The potato, which forms the staple food of the people, is extensively grown. The cultivation of the sugar beet has become of great importance. Flax and hemp are also grown; also fruit, especially plums,

[5] For the complete text of the document in English see the *New York Times* of October 19, 1918.

which constitute an article of export. Although not so well developed as agriculture, the rearing of sheep, horses, and cattle and poultry and bee farming are also extensively carried on. The unusually rich coal and iron resources of Bohemia (see map, Fig. 1) and its water power point to a high degree of industrial development. Indeed, the country in the last half of the nineteenth century has become one of the greatest manufacturing centers of Europe. The glass industry, introduced from Venice in the thirteenth century, is of great importance. The manufacture of porcelain is extensively carried on. The textile industry also stands in the front rank. Silver and leather work have a long history as local industries. Such industries exhibit the Czechs' delicate artistic sense and are capable of considerable development.

The Difficulties to be Faced

If there are any grounds for pessimism at all, they lie in the departments of administration and finance. Much money will have to be expended before the economic resources of the country can be properly made available. The opening of communications and the construction of roads and waterways will absorb large sums at the outset, to say nothing of the cost of setting up and maintaining the ordinary machinery of government, of schools, hospitals, and other institutions.[6] The reform of the system of land tenure, which entails the breaking up of huge feudal estates, is an absolutely necessary political measure which should be undertaken before the country can look forward to any agricultural progress.[7] The government, of course, will have no easy task in overcoming local prejudice against changes and in combating the power of vested interests. Taxation, too, is another difficult and intricate problem for the administration to solve. However, hope lies on the one hand in the patriotism of the people, particularly in that of the richer manufacturers and local leaders, and on the other hand in the fact that, whereas every other state in Europe resumes its normal life after the war burdened with an unprecedented debt, Czecho-Slovakia starts clear of liabilities excepting those which she voluntarily incurs for the development of her resources. If Europe is in earnest in her intention to create this new republic and is careful to go about the undertaking in a spirit of frank and painstaking justice, she may rest assured she will not be disappointed with the result of her labor.

[6] In Czecho-Slovakia there are now about 6,000 elementary schools, 110 secondary schools and junior colleges, 65 agricultural schools, 39 commercial and industrial schools, 2 polytechnic institutes, and 1 university. (Cf. E. Beneš: La place des Tchècoslovaques parmi les Slaves, *Scientia*, Vol. 23, 1918, p. 55.)

[7] Recently it has been announced that the National Assembly has already ordered expropriation of all estates in Czecho-Slovakia of more than 375 acres under cultivation and 250 of woodland. Under this law the state will take altogether 3,250,000 acres of cultivated land and 7,500,000 of woodland, sufficient, according to estimates, for maintaining 430,000 families.

ST. BRENDAN'S EXPLORATIONS AND ISLANDS

By W. H. BABCOCK

[With separate map, Pl. I, facing p. 40.]

The Lismore Version of the Saint's Adventures

The fifteenth-century Book of Lismore, compiled from much older materials, tells us that St. Brenainn (evidently St. Brendan, the navigator)—

> desired to leave his land and his country, his parents and his fatherland, and he urgently besought the Lord to give him a land secret, hidden, secure, delightful, separated from men. Now after he had slept on that night, he heard the voice of the angel from heaven, who said to him, "Arise, O Brenainn," saith he, "for God hath given thee what thou soughtest, even the Land of Promise." . . . and he goes alone to Sliab Daidche and he saw the mighty intolerable ocean on every side, and then he beheld the beautiful noble island, with trains of angels (rising) from it.[1]

Thus far, in the rather redundant style of such literature, from the Life of Brenainn in the Lives of the Saints of this old manuscript. After a century and a half of disappearance this manuscript was accidentally discovered in 1814, in a walled-up recess, by workmen engaged on repairs.

Mr. Westropp holds[2] that this Lismore version is the "simplest and probably the earliest"; but its full-blown development of certain marvels (such as the spending of every Easter for at least five years on the back of a vast sea monster as a substitute for an island) may well awaken a question as to the validity of this conjecture.

However, the suggestion of the voyage by a dream seems likely enough, and his mood was in keeping with the anchorite enthusiasm of his time. Of course he promptly set forth to find his "promised land"; at first, in a hide-covered craft, with failure in spite of long endeavor; afterward, by advice of a holy woman, in a large wooden vessel, built in Connaught and manned by sixty religious men, with final success.

Another Version

Another version gives the credit of the first incitement to a purely human visitor, a friendly abbot, St. Brendan's aim being to reach an island "just under Mount Atlas." Here a holy predecessor, Mernoc by name, long vanished from among men, was believed to have hidden himself in "the first home of Adam and Eve." To all readers this was a fairly precise location for the earthly paradise. The great Atlas chain forms a conspicuous feature of medieval maps, running down to sea (as it does in

[1] Anecdota Exoniensia: Lives of the Saints, from the Book of Lismore. Edited, with a translation, notes, and indices, by Whitley Stokes. Clarendon Press, Oxford, 1890. Reference on p. 252.

[2] T. J. Westropp: Brasil and the Legendary Islands of the North Atlantic: Their History and Fable, *Proc. Royal Irish Acad.*, Vol. 30, Section C, pp. 223-260, Dublin, 1912. Reference on p. 230.

reality) near Lanzarote and Fuerteventura, the innermost of the Canaries, which seem like detached, nearly submerged, summits of the range.

This narrative is longer and more detailed than that of the Book of Lismore and gives more plentiful indications of voyaging, especially toward the end, in southern seas. In its picture of volcanic fires it recalls occasional outbursts of Teneriffe and its neighbors. "They saw a hill all on fire, and the fire stood on each side of the hill like a wall, all burning." A visit is also recorded to a neighboring land, apparently continental, which the adventurers penetrated for forty days' travel to the banks of a magical river, whence they brought away "fruit and jewels." This may well be meant for Africa, obviously quite near these Fortunate Islands.

Attempts to Explain the Origin of the Brendan Narratives

It has been intimated that the narratives of "St. Brendan's Navigation" may have originated in misunderstood tales of his early sea wanderings around the coasts of Ireland seeking for a monastery site. He was successful in this at least, being best known (excepting as a discoverer) for the great religious establishment at Clonfert, not the first which he founded in the sixth century but the most widely known and the greatest.

Another explanation casts doubts upon his real existence and supposes the story of the discoveries to have arisen by confusion of language with the well-known pagan "Voyage of Bran," perhaps the earliest of the ancient Irish Imrama, or sea sagas.

It has also been said that the origin of the Brendan narratives may be found in "a ninth-century sermon elaborated up to its present form by the eleventh century."[3] A ninth-century manuscript is said to be in the Vatican library.

A Norman French Version

A Norman French translation was turned into Norman French verse by some trouvère of the court for the benefit of King Henry Beauclerc and his Queen Adelais early in the twelfth century and partly translated metrically into English for *Blackwood's Magazine* in 1836. It avers that the saint set sail for an

> Isle beyond the sea
> Where wild winds ne'er held revelry,
> But fulfilled are the balmy skies
> With spicy gales from Paradise;
> These gales that waft the scent of flowers
> That fade not, and the sunny hours
> Speed on, nor night, nor shadow know.[4]

They sail westward fifteen days from Ireland; then in a month's calm drift to a rock, where they find a palace with food and where Satan visits

[3] T. J. Westropp, *op. cit.*, p. 229.

[4] The Anglo-Norman Trouveres of the 12th and 13th Centuries, *Blackwood's Edinburgh Mag.*, Vol. 39, 1836, pp. 806-820; reference on p. 808.

them but does no harm. They next voyage seven months, in a direction not stated, and find an island with immense sheep; but, when they are about to cook one, the island begins to sink and reveals itself as a "beast." They reach another island where the birds are repentant fallen angels. From this they journey six months to an island with a monastery founded by St. Alben. They sail thence till calm falls on them and the sea becomes like a marsh; but they reach an island where are fish made poisonous by feeding on metallic ores. A white bird warns them. They keep Pentecost on a great sea monster, remaining seven weeks. Then they journey to where the sea sleeps and cold runs through their veins. A sea serpent pursues them, breathing fire. Answering the saint's prayer, another monster fights and kills the first one. Similarly a dragon delivers them from a griffin. They see a great and bright jeweled crystal temple (probably an iceberg). They land on shores of smoke, flame, blast, and evil stench. A demon flourishes before them, flies overhead, and plunges into the sea. They find an island of flame and smoke, a mountain covered with clouds, and the entrance to hell. Beyond this they find Judas tormented. Next they find an island with a white-haired hermit, who directs them to the promised island, where another and altogether wonderful holy man awaits them, of whom more anon.

In this version, as in others, there are passages—such as the mention of extreme cold and the account of a great floating structure of crystal—which imply a northward course for their voyage in some one of its stages. So greatly was Humboldt impressed by this and by the insistence on the Isle of Sheep, which he identified with the Faroes, that he restricted in theory the saint's navigation to high latitudes.[5]

The Probable Basis of Fact

But it is noticeable that every version gives St. Brendan the task of finding a remote island, which was always warm and lovely, and chronicles the attainment of this delight, though he finds other delectable islands near it or by the way. The metrical description before quoted is surely explicit enough, but the Book of Lismore outdoes it in a very revel of adjectives. As though praises alone failed to satisfy the celebrant, he introduces the figure of a holy ungarmented usher—a living demonstration of the benignity of the climate. He was "without any human raiment, but all his body was full of bright white feathers like a dove or sea mew; and it was almost the speech of an angel that he had." "Vast is the light and fruitfulness of the island," he cried in welcome and launched forthwith on a prodigal expenditure of superextolling words outpoured on their new delightful home. It is all perfectly in keeping with the glow and luxuriance of sun-warmed shores and the unique airiness of his spontane-

[5] Alexander von Humboldt: Examen critique de l'histoire de la géographie du nouveau continent, 5 vols., Paris, 1836-37; reference in Vol. 2, p. 166.

ous raiment. Clearly "summer isles of Eden," and nothing that has to do with icebergs or wintry blasts, are called for in this case.

About six centuries lie between St. Brendan's experiences and the earliest writing purporting to relate them and generally accepted as to date. Doubtful manuscripts and miscellaneous allusions—also often doubtful—may lessen the gap; but at best we have several centuries bridged by tradition only, and that rather inferred than known. It seems likely that he really visited and enjoyed some remote lovely islands, removed but not very often reached from the mainland, such as could in any age have been discovered among the eastern Atlantic archipelagoes. In doing so he might well meet with surprising adventures, readily distorted and magnified; and the first tales of them would be basis enough for the florid fancy of Celtic and medieval romancers, growing in extravagance with passing generations.

The Cartographic Evidence

That he found some island or islands was certainly believed, for his name is on many maps in full confidence. But as to the particular islands thereby identified we find that conjecture had a wide range, varying in different periods and even with individual bias.

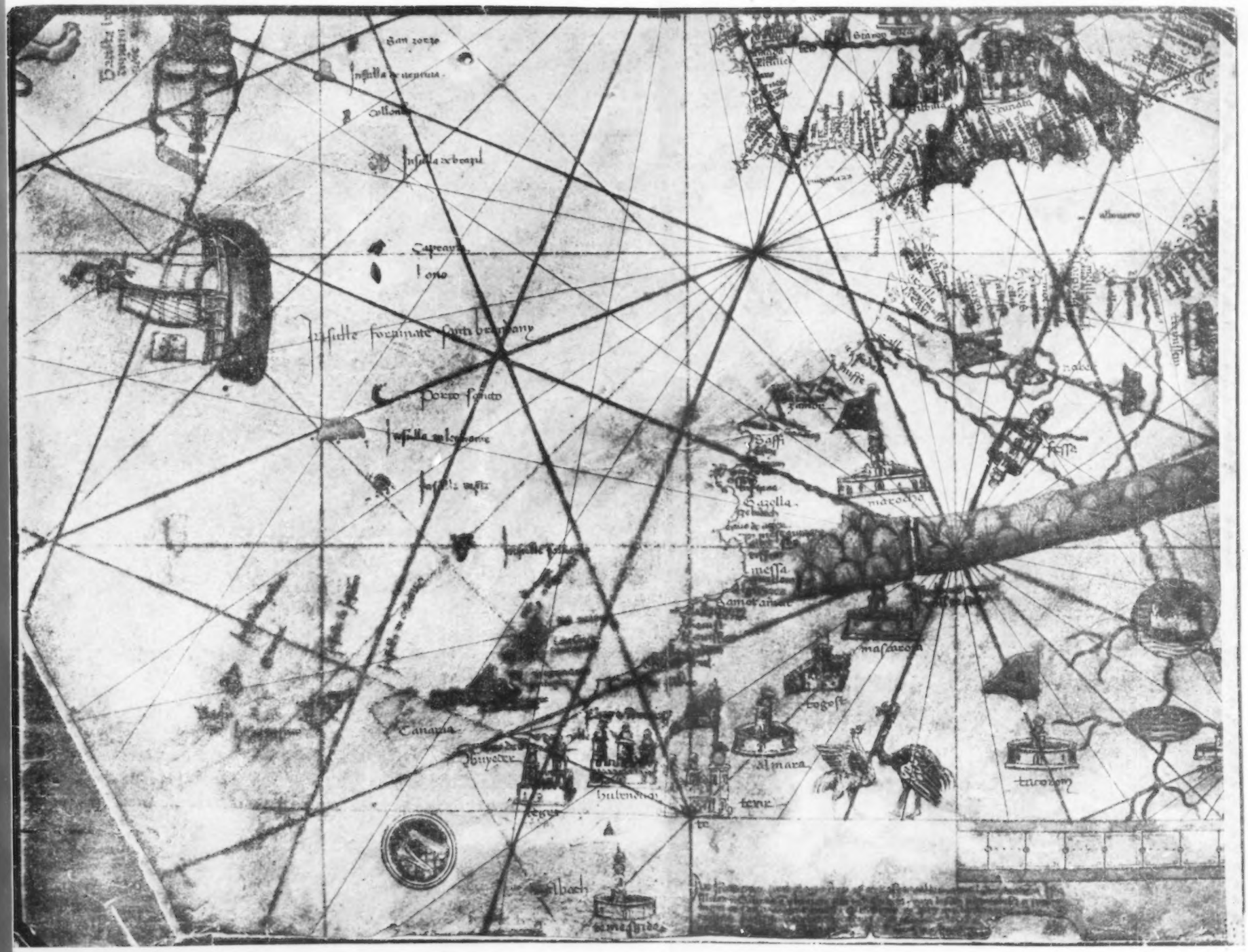
The Hereford Map of circa 1275

Probably its first appearance is on the Hereford map of 1275 or not much later,[6] the inscription being "Fortunate Insulae sex sunt Insulae Set Brandani." It is about on the site of the Canary group, and the elliptical island Junonia is just below. The showing is uncertain and conventional; also the number six misses the mark by one; still there can be no doubt that the Canaries as a whole were intended. Concerning them Edrisi had observed, about 1154: "The Fortunate Islands are two in number and are in the Sea of Darkness." Perhaps he had Lanzarote and Fuerteventura, the most accessible pair, especially in mind. The surviving derivatives of the last eighth-century Beatus map also bear the inscription "Insulae Fortunate" where the Canary Islands should be, but they assert nothing of "St. Brandan." Doubtless, dimly known, they had been reputed Isles of the Blest from prehistoric times. If St. Brendan found them, he found them already the "Fortunate Isles."

A tradition long survived—perhaps survives still—in the Canary archipelago supporting this identification by the Hereford map. Thus Father Espinosa,[7] who long dwelt in Teneriffe and wrote his book there between 1580 and 1590, avers that St. Brendan and his companions spent several

[6] R. G. Benedict: The Hereford Map and the Legend of St. Brandan.

[7] The Guanches of Tenerife: The Holy Image of Our Lady of Candelaria and the Spanish Conquest and Settlement. By the Friar Alonso de Espinosa of the Order of Preachers. Translated and edited, with notes and an introduction, by Sir Clements Markham. *Hakluyt Soc. Publs.*, 2nd Series, Vol. 21, London, 1907. Reference on p. 29.



Photograph of a section of a hitherto unpublished map by Battista Beccario, 1426, from the Munich Library, showing St. Brendan's islands.

years in that archipelago and quotes a still earlier "calendar," date not given, as authority for their mighty works done there "in the time of the Emperor Justinian." Even as late as the eighteenth century an expedition sailed from among them for an island believed to be outside of those already known and to be the one discovered by St. Brendan.

The Dulcert Map of 1339

The second cartographical appearance of the saint's name seems to be in the portulan map[8] of Angelinus Dulcert, the Majorcan, dated 1339, where three islands corresponding to those now known as the Madeiras (Madeira, Porto Santo, and Las Desertas) and on the same site are labeled "Insulle Sa Brandani siue puelan." Since *u* was currently substituted for *v*, and *m* and *n* were interchangeable on these old maps, the last two words should probably be read "sive puellam." However the ending of the inscription be interpreted, there can be no doubt about St. Brendan and his title to the islands—according to Dulcert. And that this island group must be identified with Madeira and her consorts (though Madeira is named Capraria and Porto Santo is named Primaria) hardly admits of any question.

If the identification of them with the Fortunate Islands especially favored by St. Brendan were no more than a conjecture of Dulcert or some predecessor, it still had a certain plausibility from the facts of nature and the favorable report of antiquity. Strabo may have borne these islands in mind when he wrote: "the golden apples of the Hesperides, the Islands of the Blessed they speak of, which we know are still pointed out to us not far distant from the extremities of Maurusia, and opposite to Gades."[9] Apparently, too, Diodorus Siculus, writing half a century or so before the Christian era about what happened a thousand years earlier still, means Madeira by the "great island of very mild and healthful climate" and "in great part mountainous but much likewise champaign, which is the most sweet and pleasant part of all the rest";[10] whereto the Phoenicians were storm-driven after founding Cadiz and which the Etrurians coveted but the Carthaginians planned to hold for themselves. Even since those old days there has been a general recognition of Madeira's balminess and slumberous, flowery, enticing beauty.

The Map of the Pizigani of 1367

Divers maps of the fourteenth and fifteenth centuries do not contain the name of St. Brendan (it is perhaps never spelled Brendan in cartog-

[8] A. E. Nordenskiöld: Periplus: An Essay on the Early History of Charts and Sailing Directions. Stockholm, 1897, Pl. 8.

[9] The Geography of Strabo. Literally translated with notes. The first six books by H. C. Hamilton, the remainder by W. Falconer. 3 vols., H. C. Bohn, London, 1854-57. Reference in Vol. 1, p. 226.

[10] The Historical Library of Diodorus the Sicilian, in 15 Books. To which are added the fragments of Diodorus, and those published by H. Valesius, J. Rhodomannus, and F. Ursinus. Translated by G. Booth, Esq., in two vols., London, 1814. Reference in Vol. 1, Bk. 5, Ch. 2, pp. 308-309.

raphy) and hence do not count either way. But the identification of the notable map of 1367 of the brothers Pizigani[11] is the same as Dulcert's, the inscription being also given in the alternative. Like many oceanic features of this strange production it is by no means clear, but seems to read "Ysole detur sommare sey ysole pone+le brandany." Perhaps it is to be understood as the "islands called of slumber or the islands of St. Brandan." There is at any rate no doubt about the last word or its meaning. But, as if to place the matter beyond all question, a monkish figure, generally accepted as that of the saint himself, is depicted bending over them in an attitude of benediction.

This map evidently does not copy from Dulcert, for the forms, proportions, and individual names of the islands all differ. It calls the chief island Canaria, instead of Capraria or the later Madeira, and appends a longer name, which seems like Caporizia, to what have long been known as Las Desertas, which appears greatly enlarged on it. Porto Santo is left unnamed on the map, perhaps because it lies so close to the general name of the group.

First Use of "Porto Santo" as Name of One of the Madeiras

A claim has been set up by the Portuguese that Porto Santo (Holy Port) was first applied to this island by their rediscoverers of the next century in honor of their safe arrival after peril, but this is abundantly confuted by its presence on divers fourteenth-century maps, notably the Atlante Mediceo[12] of 1351. Also the Book of the Spanish Friar,[13] dating from about the middle of that century, contains in his enumeration of islands the words "another Desierta, another Leename, another Puerto Santo." It would seem to have been a familiar appellation about 1350 or earlier, and the suggestion naturally occurs that it may have originated in the tradition of the visit and blessing of the Irish saint. At any rate, the Portuguese can have had nothing to do with conferring it.

Animal and Bird Names of Islands

Concerning such names as Canaria, Capraria, etc., which, by reason of other associations, appear oddly out of place in this group, the more general question is raised of the tendency to apply animal and bird names to Eastern Atlantic islands. Goat, rabbit, dog, falcon, dove, wolf, and crow

[11] [E. F.] Jomard: Les monuments de la géographie, ou recueil d'anciennes cartes européennes et orientales . . . ., Paris, [1842-62]: Pl. X, 1. Also W. H. Babcock: Early Norse Visits to North America, *Smithsonian Misc. Colls.*, Vol. 59, No. 19, Washington, D. C., 1913, Pls. 1 and 2.

[12] Theobald Fischer: Sammlung mittelalterlicher Welt- und Seekarten italienischen Ursprungs, 1 vol. of text and 17 portfolios containing photographs of maps, Venice, 1877-86; reference in Portfolio V (Facsimile del Portolano Laurenziano-Gaddiano dell' anno 1351), Pl. 4.

[13] Book of the Knowledge of All the Kingdoms, Lands, and Lordships That Are in the World, and the Arms and Devices of Each Land and Lordship, or of the Kings and Lords who Possess Them. Written by a Spanish Franciscan in the middle of the 14th century. Published for the first time with notes by Marcos Jiménez de la Espada in 1877. Translated and edited by Sir Clements Markam. *Hakluyt Soc. Publs.*, 2nd Ser., Vol. 29, London, 1912. Reference on p. 29.

were applied to various islands long before the Portuguese visited the Madeiras and Azores, finding them untenanted; these names long held their ground on the maps, and some of them are in use even now. The reason for their adoption piques one's curiosity. If they could be taken as throwing any light on the fauna of these islands in 1350, they might also instruct us as to the probability of prior human occupancy or previous connection with the mainland. But, of course, in any significant instances some fancied resemblance of aspect may have suggested the name.

Madeira

Madeira, meaning island of the woods or forest island, is a direct Portuguese translation from the Italian "I. de Legname" of the Atlante Mediceo and various later maps, and of the "Lecname" of the unnamed Spanish friar who tells us he was born in 1305. It is sufficiently explained by the former condition of the island, the northern part of which is said to preserve still its abundant woodland. Perhaps the modern name of Madeira (or Madera) first appears on the map of Geraldi of 1426, not very long after the rediscovery. But, with some cartographers, the Italian form of the name lingered on much later.

The Beccario Map of 1426

The alternative names, which had been given the Madeira group by Dulcert and the Pizigani, commemorating both the general fact of repose or blessedness and the delighted visit of St. Brendan, were closely blended (in what became the accepted formula) by the 1426 map of Battista Beccario, which unluckily has never been published in reproduction. Before the war, however, the writer obtained a good photograph of a part of it from Munich and herewith presents a section recording the words "Insulle fortunate santi brandany" (Pl. I). The first *a* of the final name may possibly be an *e*, having been obscured by one of the direction lines; but I think not. Beccario repeats the same inscription in his very important and now well-known map[14] of 1435, substituting "saneti" for "santi" by way of correction.

With no serious variations, this name, "The Fortunate Islands of St. Brandan" (or Brendan), is applied to Madeira and her consorts by Pareto (1455), Benincasa (1482), the anonymous Weimar map formerly attributed to 1424 but probably of about 1480 or 1490, and divers others. In several instances (the Beccario maps, for example) the words are almost

[14] Gustavo Uzielli: Mappamondi, carte nautiche e portolani del medioevo e dei secoli delle grandi scoperte marittime construiti da italiani o trovati nelle biblioteche d'Italia, Part II (pp. 280-390) of "Studi Bibliografici e Biografici sulla Storia della Geografia in Italia," published on the occasion of the Second International Geographical Congress, Paris, 1875, by the Società Geografica Italiana, Rome, 1875; reference on Pl. 8 (the second edition, Rome, 1882, does not contain the plates). Also W. H. Babcock, work cited in footnote 11, Pl. 4.

as near to the most southerly pair of the Azores, next above them, as to the Madeiras below, and it is possible that the condition of special beatitude was understood as extending to the former also.

The Bianco Map of 1448

At any rate, the verdict of the fifteenth century for Madeira was by no means unanimous. The 1448 map of Bianco,[15] which is very unlike his earlier one of 1436 so far as concerns the Atlantic, was prepared after all the Azores had been found again by the Portuguese except Flores and Corvo. It shows the old familiar inaccurately north-and-south string of the three groups of the Azores as they had come to him conventionally and traditionally, for evidently he did not dare or could not bring himself to discard them. But it also shows a slanting array of islands farther out, arranged in two groups respectively of two islands and five islands each and much more accurately presented as to location and direction than the old Italian standbys. These are quite clearly the Portuguese version, brought down to that date, of the newly rediscovered Azorean archipelago. But Bianco was obviously put to it to conjecture what islands these might be. He drew names from miscellaneous sources: in particular the largest island of the main group, corresponding to Terceira, bears the title "y^{a} fortunat de sa. beati blandan." Nevertheless, he shows and names Madeira, Porto Santo, and Deserta in their usual places. Evidently he had given up, if he ever held, all thought of annexing St. Brendan's special blessing to them. He seems very confident of the St. Brandan's island of his slanting series, for it is drawn heavily in black and contrasts with the rather ghastly aspect of some neighbors. It has nearly the form of a Maltese cross, with long arms, but there is no reason to suppose that this has any significance.

Behaim's Globe of 1492

About the same period a Catalan map[16] of unknown authorship, without copying details, adopted the same expedient of duplicating the Azores by adding the new slanting series. It is quite independent in details, however, omitting mention of "St. Brandan" in particular, though Ateallo (Antillia?) is given in the second group but not in the corresponding place. This may possibly indicate some confusion of Antillia with St. Brandan's Island, such as is more evident in the transfer of the traditional outline of the former to the latter, little changed, by Behaim on his globe of 1492.

As it stands, this globe undoubtedly gives an original and unique representation of St. Brandan's Island far west of the Cape Verde group and emphasizes it by showing Antillia independently in a more northern lati-

[15] Theobald Fischer, *op. cit.*, Portfolio XI, Pls. 3 and 4.
[16] *Ibid.*, Portfolio XIII, Pl. 5.

tude and less western longitude and also of quite insignificant size and form. But Ravenstein, who made a very thorough study of the matter, tells us[17] that this globe has been twice retouched or renovated and that the only way to ascertain exactly what was originally delineated is to treat it as a palimpsest and remove the accretions. In particular, he relates the story of an expert geographer who found the draftsmen about to transpose St. Brandan's Island and Antillia; but they yielded to his protest. Of course, it is impossible to be quite certain that these map figures are such and in such place as Behaim intended or that they bear the names he gave. The presumption favors the present showing, generally accepted as authentic. It gives the saint only one island, but this a very large one, set in mid-ocean between Africa and South America.

Possibly this location may be suggested by an undefined coast line shown by Bianco's map of 1448, previously mentioned, and, like Behaim's island, set opposite the Cape Verde group. In Venetian Italian it bears an obscure inscription, which calls it an "authentic island" and is variously interpreted as saying that this coast is fifteen hundred miles long or fifteen hundred miles distant. The map of Juan de la Cosa (1500) exhibits off the coast of Brazil, and with an outline similar to Behaim's, "the island which the Portuguese found." His date is too late to have influenced Behaim, too early to have been prompted by Cabral's accidental discovery of that very year. It is more likely that he and Behaim both were acquainted with Bianco's work or that all three drew from the same report of discovery.

Later Maps

From this time on there is never more than one island for St. Brendan, but it indulges in wide wanderings. Especially as the attention of men was attracted to the more northern and western waters, the map makers shifted the island thither. Thus the map of 1544 purporting to be the work of Sebastian Cabot and probably prepared more or less under his influence,[18] places the island San Brandan not far from the scene of his father's explorations and his own. It lies well out to sea in about the latitude of the Straits of Belle Isle. The Ortelius map of 1560 repeats the showing with no great amount of change. In short, the final judgment of navigators and cartographers, before it quite vanished from the maps, made choice of the waste of the North Atlantic as its most probable hiding place. Perhaps this westward tendency in rather high latitudes may be partly responsible for the hypotheses in recent times which have taken the explorer quite across to interior North America on a missionary errand.

[17] E. G. Ravenstein: Martin Behaim, His Life and His Globe, London, 1908, p. 59.

[18] S. E. Dawson: The Voyages of the Cabots in 1497 and 1498; With an Attempt to Determine Their Landfall and to Identify Their Island of St. John, *Trans. Royal Soc. of Canada*, Vol. 12, Section II, 1894; map on p. 86. The map is also reproduced by Jomard, in the work cited in footnote 11.

There is certainly nothing to prohibit any one from believing them, if he can and if it pleases him.

Conclusion

In general review it appears likely that St. Brendan in the sixth century wandered widely over the seas in quest of some warm island, concerning which wonderful accounts had been brought to him, and found several such isles, the Madeira group receiving his special approval, according to the prevailing opinion of the fourteenth and fifteenth centuries. But this judgment of those centuries is the only item as to which we can speak with any positiveness and confidence.

MAPPING THE UTILIZATION OF THE LAND*

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General Principles

The principles of geographic mapping, properly so called, can hardly be said to be formulated. Geographic field work is still in its beginnings, and the geographic survey is not even projected. The mapping which the geographer must develop in connection with his studies will not be for the purpose of exhibiting topography, soils, or vegetation. Maps such as these he may be obliged to prepare in the course of his work if they are not already at his hand. The true geographic map, although based on maps of the sorts mentioned, must attempt to set forth economic conditions. Certainly the aim of such a map must be to represent the ways in which the people of the area make their living and the character of this living, in so far as these things can be confined within the inelastic frame of a map.

The Existing Economic Map

There exists at present one type of map that attempts to cover the field of pure geography, the so-called economic map. Usually it is prepared for a complex group of economic conditions and for large areas and is intended for classroom use. We have, for example, economic or industrial maps of North America, which attempt to show the important agricultural areas, forest tracts, mining districts, transportation lines, commercial centers, and even other features. The technique of these maps has not been worked out satisfactorily—perhaps it lies beyond the graphic capacity of an individual drawing. The symbols employed become complicated and confusing. They are hence of little use for the purpose of instruction, for which they are made. They encounter a still greater difficulty in the extraordinary amount of generalization which they involve and in the consequent, perhaps irrepressible, conflict between their graphic qualities and truth.

An Improved Economic Map

The problem may be attacked at the other end, in the mapping of a small area on a large scale. In this way simplicity of material is secured, and the amount of generalization is much reduced. To be successful, such a map should build up a panorama of its area and should definitely and

* This paper may be considered to form the third in a series by the author, the first two of which have already been printed. These are: Proposal of an Agricultural Survey on a Geographic Basis, *19th Ann. Rept. Michigan Acad. of Sci.* (*1917*), pp. 79-86; A Soil Classification for Michigan, *20th Ann. Rept. Michigan Acad. of Sci.* (*1918*), pp. 83-91.

completely represent the area both as the home and the place of business of the group that inhabits it. The analysis, thus undertaken, may be expected to bring out the distribution of the significant activities of the area, to suggest their interrelations, and to indicate the local opportunities and disabilities of production. This means a census-taking in map form, with two principal problems, a major one of selecting the economic conditions to be represented, and a secondary one of securing proper graphic expression. The present paper is concerned primarily with the former problem.

The minimum essential of a geographic map is that it shall portray the use to which the entire land surface is put. Possibly also it may be made to show the relative value of the different types of use and the degree of effectiveness of the utilization. A map of this sort is the final member of a trilogy, of which the other two are the topographic map and the soil map. It is the outgrowth of the two that precede it, is explained by them, and, in turn, serves to interpret them.

Grouping of Land Utilizations

Since utilization is the keynote, the map must distinguish first of all between productive and non-productive areas, or else between what the United States Census designates as improved and unimproved land. In the former classification the critical element is yield, in the latter, labor. In spite of their similarity the two concepts cannot be used interchangeably. All cultivated land is, of course, both improved and productive. Pastures and meadows are productive, but may be improved or unimproved, according to the manner of their establishment. It is desirable to keep in mind both sets of criteria, giving, however, major emphasis to the matter of productivity. In this way land utilizations may be classified in the following groups: (1) barrens, (2) woodlands, (3) permanent pastures and meadows, (4) cultivated lands, (5) town sites.

Barrens

In barrens are included areas too destitute of vegetation to serve for grazing or cutting of timber, such as recent sand dunes, beaches, and areas of bare rock. In general this is permanently waste land, in so far as direct use of soil and surface is concerned. Doubtful cases may be found in burned-over tracts in which the humus has been destroyed and the soil baked and in areas of severe soil erosion.

Woodlands

A double classification of woodlands is needed: (1) the first to designate *type* of forest growth, which may be by the method of the ecologist or by the similar forest-composition classification of the forester; (2) the other to

show the *condition* of the forest. The latter opens up in part new problems, as the work of the Forest Service has been concerned with large tracts of forest and these have been differentiated mainly by composition and age. A grouping may be worked out on the following lines:

(a) Wood lots. Under this heading fall the smaller forest tracts in the agricultural sections, chiefly woods that belong to farms. The ordinary wood lot is not held for the value of its timber but is an appendage to the farming land and consists of land for which there has not been the time or means of clearing or else of land that it is difficult or undesirable to clear. Often it is a general utility tract on the poorest part of the farm. Here firewood and fence posts are secured, and stock is pastured when it is not desirable to have it on the usual pastures. It is not significant whether it contains valuable timber or not. Its principal importance is its place in the general economy of the farm, not as a distinct investment in timber land.

(b) Cut-over lands, including non-commercial "second growth." This is land from which at least the more valuable forest has been removed but which has not been diverted to other uses. It is temporarily therefore in a non-productive condition or nearly so. The classification is applicable only to large tracts. Small portions ordinarily are parts of farms and are there classified as wood lots or stump pastures. There may be irregular and incidental production from these lands, but in the main they are now waste lands, compared with what they once were and may become again. Where fires or erosion have followed deforestation in such manner that the soil is gone and where therefore forests cannot return within a reasonable number of years, the land should be placed in the "Barrens" class.

(c) Commercial timber land. In this case land will be valuable immediately and primarily for its timber. The line between cut-over land and timber must be drawn according to local circumstances that determine what constitutes commercial timber. Where mill lumber only is being produced, the yield in saw logs will determine the status of the forest tract. In other places a certain amount of timber of tie size and quality will be prerequisite to classification as of commercial value. This will be the ordinary condition. The modern forest survey covers determination of stand and merchantability in detail, and guidance may be had from this source. Tracts mapped as commercial timber should be kept distinct from all forest lands of the wood lot type.

Timber of scrub growth as a rule will be identified sufficiently by the "type" classification, as, for instance, blackjack oak and jack pine. A separate "condition" classification for scrub growths seems therefore unnecessary. For those rare instances in which forestry is being applied and in which the forest land is being made into a permanently producing tract, a third classification may be introduced by means of a superimposed symbol to indicate "treatment."

Permanent Pastures and Meadows

Under permanent pastures and meadows belong: (a) meadows, areas of wet land from which hay is cut and which may also be used at times for pasturage; (b) wood and stump pastures, partially cleared forest lands in transition from forest to grass land. These are used primarily for grazing, the timber being a remnant of small significance in the utilization of the land. There should also be included (c) other wild pastures, such as upland pastures on thin, dry soils, and (d) seeded pastures, a rare type of permanent pasture land, as most seeded pastures represent a temporary use of cultivated land.

Cultivated Lands

The major divisions of cultivated lands are well established, namely agricultural and horticultural uses of land. In horticulture further simple subdivisions are possible because the product of an individual tract ordinarily remains the same through a series of years. We have therefore orchards, vineyards, truck land, and so on. In agricultural use, on the other hand, the crop of the individual field is commonly changed at frequent intervals. It is true that there are large districts in the South in which cotton is grown on a field continuously over long periods and that similarly there are lands in the Middle West on which nothing but corn is ever produced. Single-crop practices, however, are becoming more and more exceptional. Ordinarily the cropped lands can be distinguished best by crop series. In a crop series are to be included all the important crops commonly grown on the tract in question. The simplest illustration is found in the crop rotation. Here a certain number of crops are produced in a definite succession. A crop rotation constitutes a crop series, but the latter term is more comprehensive. Thus we may have a corn-oats-clover series in which these three crops may be grown (1) in definite rotation, (2) in accidental succession, or (3) under a system in which one farmer may emphasize one crop, a second another, according to individual choice. In spite of these variations of practice it should be readily recognizable that the utilization of a particular type of land is in the growing of one of these crops or of the group of them. A second series may be wheat-oats-timothy-clover. An individual crop therefore may appear in the designation of more than one crop series. The map, as executed on this basis, will differ widely from the crop of an individual year and even from such a map of a series of years. It is in fact not a crop map but a map of cropping practice. It will represent the formulas for the relation of cropping practices to type of land. The order in which crops appear in the series is of course not the order which they follow on the land, but a grouping according to their relative importance in the cropping practice. The most profitable crop or the most widely raised crop would therefore appear first. These series, it is believed, are in general in quite definite

relation to type of land. Over most of the country farm practices are fairly well established. Even where they do change, a successful group of crops is more commonly expanded than abandoned. It is believed therefore that such a map will represent a considerable degree of stability.

Town Sites

Interesting and valuable studies may be made of the distribution of land use in an urban district. The distribution of residence sections of varying conditions, parks, vacant property, factory districts, retail business, wholesale and warehouse districts, and shipping terminals furnishes a field of inquiry that is almost untouched by the geographer. In this connection mapping would furnish material for detailed analysis of the locational factor in the evolution of a city. This study of dominant focal points and the distances of their influence is impossible without such a map and hence remains mostly undone. Work of this type would contribute valuable data to the "city plan" idea. The city plan is an attempt to find the best use of the land that constitutes the city. In other words, it tries to discover the geographic adaptations of the sections of a city instead of leaving this discovery to the scarcely less sure but vastly slower workings of natural growth.

Value of This Plan of Mapping

The outline as given emphasizes throughout the fact of productivity and differentiates between those areas that are at work and those areas that are being carried along as incumbrance. The plan also attempts to characterize manner and degree of utilization. Beyond these general principles it does not appear desirable to lay down a scheme of classification. Local conditions will point the necessary modifications for translating such a plan into practice.

Mapping of the land by such a plan supplies a definite objective to the geographer by a relatively exact method. It keeps in view its definite purpose, the intensive study of regional geography, and approaches it by a route that is direct though hard and tedious. It eliminates facile generalizations and the plausible and insecure reconnaissances that constitute too large a part of geographical literature. It invites, and probably necessitates, the co-operation of the economist, the agronomist, and the forester. In addition to furnishing badly needed material to the student of regional geography the mapping may serve broader purposes. The cognate fields of economics, agronomy, and forestry can draw therefrom. To the man financially interested in the area the map gives information of economic conditions. To the traveler it explains the country. The strategic value of such a map is indicated by the great detail in which military maps represent the use to which the land is put. In combination with soil maps this type of map may be utilized in the equalization of taxes, not merely

by boards of review but also as a partial foundation for a scientific system of tax assessment, an institution that we now lack. Expectations of these and other possible uses are based on the fact that the projected map is a mode of analysis of economic conditions.

Its Final Application

There remains the final application of the study. By the time the plan has been converted into a map for a given area, the economic situation of that area is well understood. Hence the prospects of future development should be apparent. The next step, accordingly, is to state the most appropriate future uses of the land. Is land being cultivated that should not be? Is land idling that could be making a satisfactory growth of trees? Are there undeveloped grazing areas? What wild land may be developed as farm land in fairness to the men who will live upon it? The study of present utilization must inevitably bring up questions such as these. The map that shows land utilization is logically succeeded by the map that provides land classification. The economic map of the present must point out both nature and extent of the wastes and abuses of land. The land classification map, then, will indicate the best and most complete use of the land in the immediate future, especially the protection of lands that are being used improperly, the development of needlessly idle lands, and the change in the use of lands now unprofitably employed. Land classification proposes stimulated and remedial use, not by the assertion of means that are ultimate and without alternative but along lines that are proximate and feasible. The three steps follow inexorably: first the study of the soil, then the study of existing conditions, and finally the program to secure the best results possible in any near future.

Example

In connection with a detailed geographic study of a small area, a map of the type projected has been made.[1] The area involved is Bridgewater Township, Saginaw County, Michigan. Relief throughout is slight, as the area consists of lake beds and beaches, a water-laid moraine, and an obscure flood plain. The soils are silty and sandy, the sand content in general increasing as one goes south. There is no absolutely waste land. The main problem lies in the representation of agricultural use.

The original map recorded the employment of fields down to five-acre tracts in the crop season of 1918. Detailed notes were kept on crop practices. From this work it shortly became apparent (1) that a large number of crops are grown, (2) that the area planted to an individual crop on a single farm is small, and (3) that these crops can be combined into a small

[1] This work is based on a field study by Miss M. K. Horning in the summer of 1918. The maps here represented are her interpretation of the principles set forth in the previous section.

number of groups or crop series. The resultant generalization is Figure 1. The major series is hay-oats-corn-pasture. The order expresses the decreasing order of importance in the farm economy of the one type of land. Hay is the first crop. If this area were reduced to a considerably smaller scale

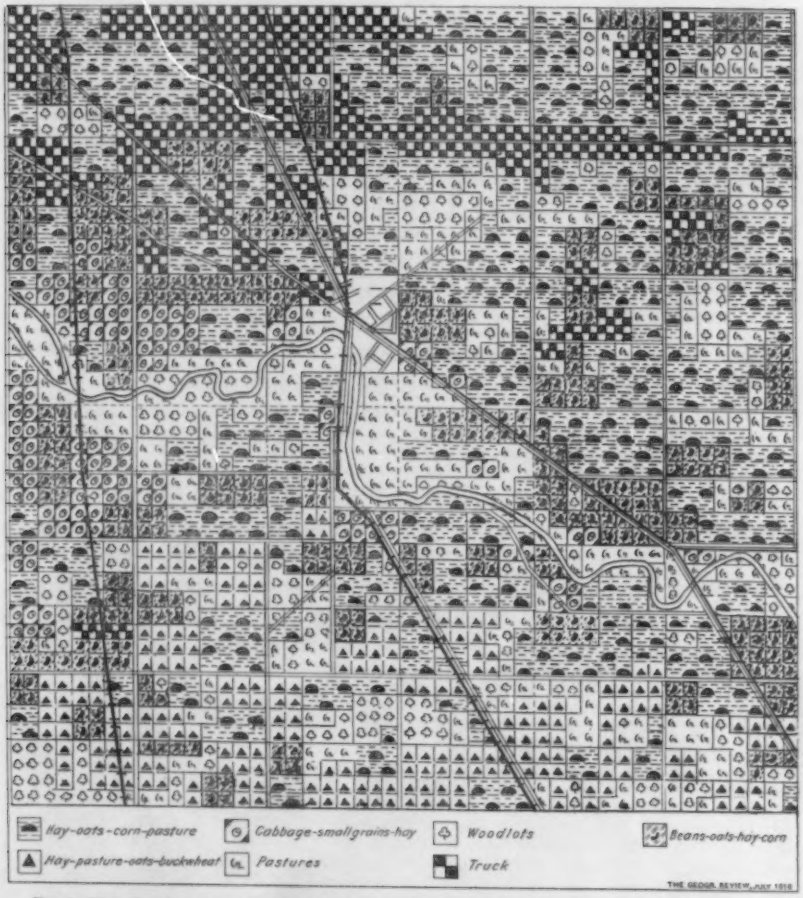


FIG. 1—Map showing, according to the method suggested in the paper, the utilization of the land in Bridgeport Township, Saginaw County, Michigan. Scale, 1:82,000.

map, say a map of Michigan, the entire area might appear as dominated by hay growing. Enough land is cultivated to grow the local supply of oats and much of the corn needed. After a number of years of cultivation fields are usually pastured for a period. The grass culture at both ends of the series suggests the importance of stock-raising. It is in fact a type of mixed small farm that emphasizes stock. With a somewhat more intensive cultivation of the same type of land a series beans-oats-hay-corn emerges,

in which the bean crop supplies the farm with ready money. The poor, sandy land to the south gives the group hay-pasture-oats-buckwheat. On rather heavy lake beds cabbage is the most important crop, and the series cabbage-small grains-hay is constituted. Finally there are the truck-growing sections, located mostly on sandy loam and along good roads. The cultivated land represents 71 per cent of the total surface.

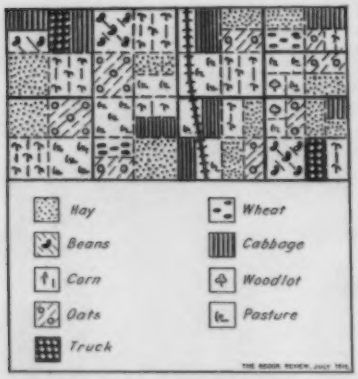


FIG. 2—Map of northern half of Section 19, showing crops as grown in 1918. Scale, 1:31,680. Solid black lines represent farm boundaries, broken lines boundaries of fields.

Figure 2 represents a half section taken from the field map to show actual crop conditions in a typical section of the heavier lands. This is an adaptation of the type of study carried on by the Office of Farm Management of the U. S. Department of Agriculture on individual farms. In the present type of study it is proposed to supplement the generalized map of the type of Figure 1 with ungeneralized maps of the second type to show actual crops in a given year for the different type areas. In the further development of the plan it is expected that field mapping may be done directly in both types. The generalized map may be developed directly in the field by discovering the several crop practices. At type locations a section or even less may then be mapped in the ungeneralized form to furnish the specific illustration of the application of an individual crop practice.

GEOGRAPHICAL RECORD

NORTH AMERICA

Arable Land in the United States. A recent paper on "Arable Land in the United States," by O. E. Baker and H. M. Strong (*Yearbook Dept. of Agric. for 1918*), describes in outline the location and extent of present arable, non-arable, and potentially arable land in this country. Most of the present arable land lies east of the 100th meridian, and this produces four-fifths of the corn, three-fourths of the wheat and oats, and three-fifths of the hay crop of the nation. In order that land may be adapted to the production of crops, several conditions must be met. First, it must not be so stony or hilly as to prevent the use of the plow and of other farm machinery. Nearly one-fifth of the land area of the United States is too hilly or too rough for successful crop production. A second condition is that the rainfall must be sufficient. Where the mean annual rainfall in Montana is less than 12-15 inches, or less than 18 inches in eastern Colorado, 20 inches in the Texas Panhandle, and 25 inches in the lower Rio Grande Valley of Texas, the production of crops without irrigation is a precarious undertaking. The minimum rainfall needed for successful crop production varies from 9 to 30 inches in different parts of the United States, the amount depending on the local conditions of soil and climate. As a general rule, the rainfall requirement increases from north to south with increasing evaporation (under higher temperatures) and with the occurrence of a less favorable seasonal distribution of precipitation. It is estimated that nearly one-third of the land area of the United States receives too little rainfall for profitable crop production at normal prices and has no possibility of irrigation. Occasional years of heavier rainfall than normal result in large profits, but in the long run it is better business policy to use such lands for grazing, raising only a few acres of crops for supplementary feed in swales and seepage basins.

A third condition, also climatic, relates to the length of the growing season. The amount of heat must be sufficient, and the season between the first and last killing frosts must be long enough to mature the crops. Lastly, there are considerable areas where the soil is too sandy or infertile for profitable crop production at prevailing prices. These districts are better adapted to forests. Taken in all, more than one-half of the land area of the United States is unfitted for profitable crop production because of rough topography, deficient rainfall, low temperature, or infertile soil. With the exception of about 40,000,000 acres of desert, this land is used, to a greater or less extent, for the production of wood and timber and for grazing stock.

"Potentially arable land" consists of forest, "cut-over" land, and woodland, including that in farms, covering more than one-tenth of the land area of the country; and also some 60,000,000 acres of swamps and other wet lands susceptible of drainage. A third expansion of the agricultural area is to be sought in the potentially irrigable land which is awaiting development in the West. This is estimated at 30,000,000 acres, if all available sources of water supply were fully utilized, and would double the present area of irrigated land. It is to be noted, however, that the cost of construction of dams and of canals and ditches becomes greater and greater as less and less favorable projects are developed. Even now the supply of land under the ditch and ready for farming in several Federal reclamation projects exceeds the demand at the price quoted. There are, further, about 50,000,000 acres of "unimproved land other than woodland" in the rainier Eastern States, consisting of unused fields, stony upland pastures, "abandoned farms," and waste land. Of this, probably not more than two-thirds will ever be put into crops. Lastly, a further development of dry farming may provide for a few more farmers in the West.

Certain economic considerations have to be taken into account in this matter. The country will require a woodland area of at least 450,000,000 acres to supply a population of 150,000,000 people. Hence, a good deal of potentially arable land will remain in forest. Again, an appreciable portion of land suitable for crops will remain as pasture. It seems probable that the area in crops will never reach the estimated possible total of 850,000,000 acres. The increasing cost of reclamation will lead to a more intensive cultivation of the more fertile or favorably situated land, and to the use of the lower grades of arable land for grazing or timber production. The well-cultivated lowlands and the "abandoned farms" in the highlands of the northeastern states illustrate this tendency.

R. DEC. WARD

American Meteorology and the War. Among the scientific contributions made by the United States towards winning the war, the meteorological work carried on by the Weather Bureau, the Army, and the Navy was of peculiar importance. It is well that, as a chapter in the scientific history of the war, there should be available some authoritative account of the various phases of this work. The *Monthly Weather Review* for April, 1919, contains a series of papers which furnish much general and interesting information on this subject. The most important results accomplished in connection with the "Aerological Investigations of the Weather Bureau During the War," which are discussed by Willis R. Gregg, were (1) the aid given the Army and the Navy in organizing and equipping their meteorological services, and (2) the information and advice furnished both military and naval services regarding free-air conditions. Lieutenant Colonel R. A. Millikan (Signal Corps, U. S. A.), who begins his paper on "Some Scientific Aspects of the Meteorological Work of the United States Army" with the statement that "prior to 1914 a meteorological section was not considered a necessary part of the military service," enumerates four distinct divisions of his problem as follows: the extension of our knowledge of the law of motion of pilot balloons; the procurement of data and the development of methods for the preparation of artillery range tables; the development of long-range propaganda balloons; the charting of the upper air in the United States and overseas, in aid of aviation.

Captain B. J. Sherry and Lieutenant A. T. Waterman describe the work of "The Military Meteorological Service in the United States During the War." The problem was "the project of creating what was in many respects an entirely new service for the Army designed to supply the military organization with complete and up-to-date meteorological information, and this as promptly and efficiently as possible." "The Work of the Aerographic Section of the Navy" is briefly described by Lieutenant Commander Alexander McAdie, U. S. N. R. F., Senior Aerographic Officer, and emphasizes the extraordinarily rapid development of this branch of meteorological activity, which was not organized until January, 1918. Commander C. T. Jewell, U. S. N., retired, gives an account of the "Work of the Naval Observatory in Connection With Naval Aerography," and R. H. Finch, U. S. N. R. F., describes "Meteorology in the Naval Aviation Service Overseas." Other papers are devoted to descriptions of the special forms of instruments or of graphic devices which were used or devised in connection with war meteorology.

The whole series of articles gives an interesting account of the meteorological activities of the United States Government during the war. It is a record of good work, well done, of which the country may be proud. R. DEC. WARD

The Roosevelt Wild Life Forest Experiment Station. Until the recent establishment of the Roosevelt Wild Life Forest Experiment Station at Syracuse, N. Y., there had never been before in America and probably not in the world a station devoted primarily to the study of forest wild life. This first station of its kind is described by Dr. Charles C. Adams, its director, in *Science* for June 6, 1919. The station is a memorial to the late Colonel Theodore Roosevelt in recognition of his interest in and work for forestry and wild forest life. New York State is a particularly appropriate place for such a station not only because it was his home state but because of the large extent of forest land and fresh-water surface, which nearly equals in acreage the extent of tilled land and thus leads to economic and social problems of high rank. The duties of the station are described as follows: "to make investigations, experiments, and research in relation to the habits, life histories, methods of propagation and management of fish, birds, game, and food and fur-bearing animals, and forest wild life." In addition to its conservation features the plan provides for the training of students who wish to specialize in this kind of ecologic work, either as technical forest investigators or as practical foresters interested in the management of fish and game. It is expected that the memorial will receive support from the Legislature of New York as well as from private citizens who wish to honor the memory of Roosevelt.

AFRICA

The French Penetration of Morocco. In 1912, when Morocco came under French protection, the country was being desolated with strife and lawlessness. Already France had been compelled to intervene on the Atlantic seaboard at Casablanca and in the east that marches with Algeria. Real pacification began at the end of April, 1912, with General Lyautey in charge of the formidable task. Two years later the European War broke out, and to those unacquainted with the genius of the Resident General the prospect looked dark indeed—pacification so recently begun and still far from complete; turbulent tribes stirred beyond their wont by ceaseless German intrigue; the govern-

ment's forces depleted—what hope was there for Morocco? General Lyautey solved the problem by maintaining all the frontier posts and advanced marches intact, by redoubling the initiative of the remaining mobile forces on the untamed front. Since 1914 the area of occupation has been extended and the pacified tribes have remained loyal, nay more, they have offered their services to the cause of France (Augustin Bernard: La France au Maroc, *Ann. de Géogr.*, January, 1917. The map of penetration, reproduced herewith, should be compared with the orographical, rainfall, vegetation, and

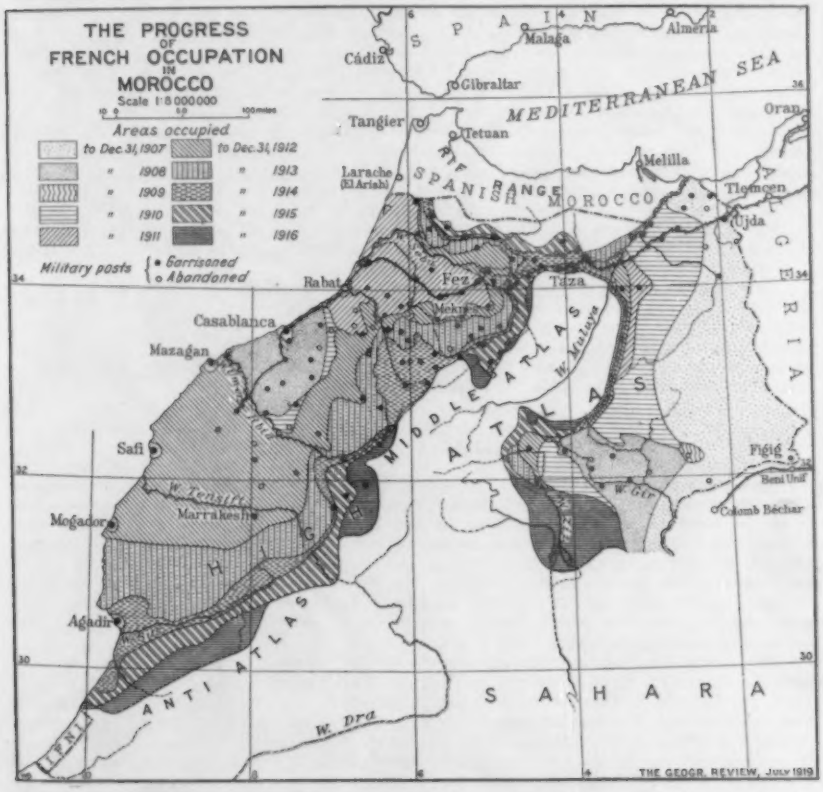


FIG. 1—(Based on a map accompanying the paper cited in the text.)

population maps accompanying Alan Ogilvie: Morocco and Its Future, *Geogr. Journ.*, Vol. 39, 1912, and A. Bernard: Le Maroc, Paris, 1913.)

The progress and policy of French penetration in Morocco can only be understood if the geography of the country be appreciated. Early occupation took place in the most accessible regions, the eastern plain and plateaus that continue the Algerian steppes, the fertile black-earth plains, and the plateaus bordering the Atlantic, the only region accustomed to submission, the only part of the Sherifian Empire really controlled by the Sultan. Separating the eastern and western areas are the chains of the High and Middle Atlas and the Rif of Spanish Morocco. The mountains dominate the plains, and the mountain people, whose order of life is so different from that of the plains, dominate the plainsmen, for they are the perpetual disturbers of the peace. Occupation of the plains alone affords no security; to be master anywhere the central authority must be master everywhere. The least known, the most inaccessible part of the mountain region, is the Middle Atlas, the Gordian knot of French occupation as it is the orographic knot of the country. In the extreme south and, more important, to the north, in Spanish Morocco, are two other insurrectionary centers by which the connecting link of Middle

Atlas Berbers receive German arms and ammunition. In particular, annoyance is still caused by the notorious Raisuli, a brigand who has raised himself to the status of an independent chief. Between the Rif and the Middle Atlas, however, there exists the *couloir* of Taza, the narrow passageway that before the formation of the Straits of Gibraltar was the outlet for the Mediterranean. The Taza *couloir* is a historic route between Algeria and Morocco. Romans, Vandals, and Arabs have passed along it; possession of it is vital to any power claiming authority over northwestern Africa. Hence, despite the dangers while the heights are in enemy hands, it has been occupied; and one of the main objectives of present penetration is the widening of the gap southward; on the north of course nothing can be done. Occupation will shortly be sealed by completion of the railroad. Today (see: La Foire de Rabat, *L'Afrique Française*, Sept.-Nov., 1917) there remains only a short link to connect Taza and Fez and thus unite Algeria with the Atlantic coast. The frontier force is likewise particularly concerned with isolating the two main Berber groups of the Middle Atlas, the Beni-Waraïn with the Riata and the Zaïan. Between them lies a weak spot in the rampart of the Middle Atlas, a gently sloping plateau giving access to the heart of the mountains. It is occupied by the nomadic Beni-Mgild and Beni-Mtir, people who, because of their nomadism, are more approachable than the neighboring Berber tribes, tied to the cultivation of their isolated mountain valleys. South of the Atlas is projected the opening of routes in the Sahara whereby a system of policing may be established in connection with the existing organization of the *méharistes* of Mauritania and southern Algeria, the "Northwest Mounted Police" of the Sahara.

Details of the latest movements in Morocco are published in the number of *L'Afrique Française* for January-February, 1919 (pp. 23-28). The extent of German intrigue is very evident: the situation was always in close sympathy with that in Europe. Insurgent endeavors were specially great during April, May, June, July, 1918. News of the armistice was not credited, and there were further outbreaks in December and January, but these appear to have been "the last wave."

AUSTRALASIA AND OCEANIA

Hawaiian Forest Reserves. Following the policy established by the United States on the continent, the Hawaiian territorial government has set apart certain well-timbered areas as forest reserves. According to the December, 1918, issue of the *Hawaiian Forester and Agriculturist*, official organ of the Board of Agriculture and Forestry, the designation of five new districts on December 31 completed the area to be so segregated. The latest additions increase the forest reserves by 41,355 acres, bringing the total so set apart in the different islands up to 554,842 acres. Added to this there are some 260,000 acres, which, though still privately owned, it is expected to have protected and administered in a similar way.

To science the Hawaiian forests are of peculiar interest because of their distinctly endemic character. (See an article by Vaughan MacCaughey in the *Plant World*, Vol. 19, 1916, pp. 162-166.) Commercially the only timber of importance is that from the *ohia* and the *koa* trees, the former, a dark, hard, close-grained wood, being used for flooring, railroad ties, and paving blocks, while the latter, the so-called "Hawaiian mahogany," is much prized for its beautiful golden-red wood, suitable for fine cabinet work and for interior furnishings.

The greatest value of the forests, however, is as a protection to the watersheds of the islands. The windward slopes throughout the archipelago receive from 400 to 500 inches of precipitation a year. With the forest cover removed, this heavy rainfall would soon occasion destructive floods and excessive erosion. On the other hand the westward, or leeward, side of the islands is in most cases decidedly arid and can be cultivated only by means of irrigation.

Owing to the porous character of the volcanic soil much of the water now sinks deep into the ground but has been successfully reached by artesian wells. On some plantations the abundant water power of the rainy slopes is utilized to generate electricity, which, wired to the desert districts on the other side of the island, pumps water from wells to irrigate the fields. In 1917, according to the publication cited above (May, 1918) 62 per cent of the sugar, the principal product of the islands, was grown on irrigated land. It would seem evident, therefore, that the continued prosperity of the inhabitants depends in very large measure upon the proper control of the stream flow and the protection of the areas which supply the artesian basins, both of which can be accomplished only by the conservation of the forested districts on the higher lands.

The chief destructive agents are fires, wasteful cutting of timber, and the wild cattle that abound in some of the mountainous districts. Against these the forestry

service can contend successfully only when the regions concerned are placed under government administration.

As in other such reserves an attempt is being made to render the districts segregated of further value to the people, by opening some of them for camping sites and by preserving the natural beauties for which the islands have long been famous.

ECONOMIC GEOGRAPHY

Sea Bamboo As a Source of Potash. Among the problems of the war was the manufacture of chemicals formerly derived from Germany or from sources outside of Germany where production was affected by abnormal conditions of trade. Mr. G. F. Britten in the *South African Journal of Science* for October, 1917, published a valuable account of his experience with seaweed as a source of potash in South Africa. There is a variety of seaweed which grows in great abundance near the shores of the Cape peninsula and is known as sea bamboo. The use of seaweed as a fertilizer has been known, of course, for many years. In the Channel Islands seaweed was collected and allowed to dry near the shore and then burned on the household hearths and the ash sold to farmers, who used it on their wheat fields. Seaweed is also used along the New England coast, in California, and many other localities.

Mr. Britten selected for his analyses freshly stranded specimens of sea bamboo. He found that from the trunk portion of the seaweed he could derive an ash containing not less than 33 per cent of potash and from the leaves an ash which contained not less than 22 per cent, which on a pre-war basis would be worth $40 and $27 a ton respectively. He further discusses the direct use of the seaweed and points out that bordering the coast of South Africa are hundreds of different varieties, of which little or nothing is known except the composition, and urges action looking toward the building up of an industry that will yield important results in South African agriculture.

PHYSICAL GEOGRAPHY

Solar Radiation Observations and Weather Forecasting. A very interesting investigation, which may lead to results of unusual importance, is being carried on by the Smithsonian Institution and Mr. H. H. Clayton, Chief of the Division of Forecasts of the Argentine Meteorological Office. Since July 27, 1918, the Smithsonian Astrophysical Observatory has been conducting daily observations at Calama, Chile, of the solar constant of radiation. By means of special devices, and owing to the skill and zeal of the observers, Messrs. A. F. Moore and L. H. Abbot, the determination of the solar constant of radiation is completed on the same day that the observations are made. The result may, if desirable, be telegraphed within ten hours of the beginning of the observations. Mr. H. H. Clayton, at Buenos Aires, is in communication with the observers at Calama and is making studies of the relations of temperatures in Argentina to the values of the solar constant determined at Calama. Correlations as high as 68 per cent have been found between the two variables.

If temperatures at any station may eventually be predicted for some time in advance on the basis of measurements of the solar constant of radiation, a considerable number of solar radiation stations will be necessary in widely separated cloudless districts (C. G. Abbot: Work of the Smithsonian Astrophysical Observatory at Calama, Chile, *Monthly Weather Rev.*, Vol. 47, 1919, pp. 1-3). R. DEC. WARD

Increase of Precipitation on Mountains. Professor Alfred J. Henry, of the Weather Bureau, read a paper on "Increase of Precipitation With Altitude" before the Association of American Geographers at Baltimore, December 27, 1918, which has been printed in a recent number of the *Monthly Weather Review* (Vol. 47, 1919, pp. 33-41). Various factors control the relation between altitude and rainfall. When mountain systems are more or less parallel with the direction of the rain-bearing winds, there is little or no increase in precipitation. Other things being equal, the steeper the slope of the mountains, the greater the precipitation. The temperature and relative humidity of the air at the beginning of the ascent obviously determine to a large extent the quantity of rain or snow which falls, as does the duration of the rainy winds. The altitude of the zone of maximum rainfall seems to vary but little with latitude. It averages somewhat under 1,000 meters in the tropics and between about 1,400 and 1,500 meters in temperate latitudes. It is lowest in winter and highest in summer. R. DEC. WARD

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

SOUTH AMERICA

General

NORDENSKIÖLD, ERLAND. **Om Indianernes Anvendelse af Gummi i Sydamerika. Et lille Bidrag til Gummiindustriens Historie.** Map, diagr. *Geografisk Tidskrift*, Vol. 24, 1917, No. 3, pp. 80-86. Copenhagen.

When Roosevelt made the famous journey recorded in his book "Through the Brazilian Wilderness" he was astonished to find the Indians "playing football with their heads," using a hollow rubber ball perhaps eight inches in diameter, which they butted back and forth with their heads. Dr. Erland Nordenskiöld, the Swedish explorer, has unearthed some tales of early travelers who record similar games. Thus Gumilla in the eighteenth century saw the Orinoco Indians playing with a ball made of a juice called *caucho*, and Oviedo in the sixteenth century found the natives of Hayti playing with balls which evidently were made of rubber. The curious feature of these games was that the ball must always be caught with the head, shoulder, hip, or knee, never with the hands.

The author himself has seen Indians in various parts of South America playing ball with their heads. In his "Indianlif" he tells a charming fairy tale of the Chané Indians. Aguaratunpa has caught a white condor, and the bird offers him a houseful of silver dishes in return for its freedom. Aguaratunpa scorns the offer but bids the condor bring him the white rubber ball "tóki." The bird does so and wins its freedom but manages to recapture the ball as it bounds back and forth between the heads of the players. So Aguaratunpa catches another bird and sends it out for the black rubber ball.

Nordenskiöld believes that the Indians invented the rubber syringe and that the tube was probably suggested to them when forming hollow balls around a lump of clay and washing out the soil afterwards. He thinks they used rubber for various other utensils, for dolls for their children, and for impregnating cloth. In fact, he comes to the conclusion that the entire civilized rubber manufacture is based on experiments carried out by the Indians before the advent of the white man. HANNA A. LARSEN

BAILEY, S. I. **Astronomical work in South America.** *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 12-16 (discussion, pp. 15-16). Washington, D. C., 1917.

BARCLAY, W. S. **The geography of South American railways.** Maps, diagr., ills. *Geogr. Journ.*, Vol. 49, 1917, No. 3, pp. 161-201; No. 4, pp. 241-282 (discussion, pp. 277-282). [Railroad development in South America is only beginning to assume international phases. Because of the local character of the systems, itself an aspect of "these curiously self-centered South American states," the systems of each state are considered separately.]

BAUER, L. A. **Status of magnetic surveys in South America by the Carnegie Institution of Washington.** Map. *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 20-28 (discussion, pp. 26-28). Washington, D. C., 1917.

COLEMAN, A. P. **Permo-Carboniferous glacial deposits of South America.** Ills. *Journ. of Geol.*, Vol. 26, 1918, No. 4, pp. 310-324. ["Recent advances in the study of the South American Permo-Carboniferous glacial deposits bring that continent into the same rank as South Africa and Australia with respect to the area then covered by ice, while India has been much surpassed. The magnitude of the geological problem involved is growing from year to year, and the difficulty of accounting for such tremendous climatic changes is by no means lessening."]

FARABEE, W. C. **The Arawaks of northern Brazil and southern British Guiana.** Ills. *Amer. Journ. of Phys. Anthropol.*, Vol. 1, 1918, No. 4, pp. 427-442. Washington, D. C.

NORDENSKIÖLD, ERLAND. **Die Anpassung der Indianer an die Verhältnisse in den Überschwemmungsgebieten in Südamerika.** Maps, ill. *Ymer*, 1916, No. 2, pp. 138-155. Stockholm.

PARAGUAY, URUGUAY, ARGENTINA, CHILE

COOPER, J. M. **Analytical and critical bibliography of the tribes of Tierra del Fuego and adjacent territory.** ix and 233 pp.; map, bibliogr., index. *Bur. of Amer. Ethnology Bull. 63.* Smithsonian Institution, Washington, D. C., 1917.

Anthropogeographical literature is greatly enriched by the publication of this small book. The work falls naturally into several subdivisions. Pages 1-58 are taken up with valuable introductory remarks on the Yahgans, Alacalufs, Chonos, and Onas. The fullness of these remarks varies with the amount of available material, but in general their subject matter is grouped under headings: Names, Territory, Linguistics, Somatology, Culture, and Present Condition. Pages 59-64 are filled with an interesting review of the history, present status, and future of anthropological investigations in Fuegia. Pages 65-136 are occupied by a very extensive author bibliography in which every item enumerated is followed by critical remarks, often in the form of the contents of the work in question. Pages 137-228 contain an equally satisfactory subject bibliography which is incidentally a very full and stimulating outline of Fuegian somatology, linguistics, and culture.

One of the most important parts of Cooper's work is that which deals with the archeology and cultural relationships of the Fuegians, pages 218-228. This portion of the work is of value as showing that there are certain justificatory grounds for linking the Fuegians with the earliest peoples of South America and with the Lagoa Santa race. It remains to be seen to what degree this information will dovetail with that being gathered by Spinden and by the present reviewer on the archaic culture of Central and South America. In the meanwhile it is necessary merely to note that the Fuegians may turn out to be modern survivors of the archaic culture people on whom all later cultures in the region named succeeded. From the geographical standpoint this would be wholly natural, for it would be expected that the oldest, lowest-cultured, and weakest portion of the human race in Central and South America should be driven into the least desirable parts of the continent by succeeding waves of people. It is noteworthy that Cooper says (p. 219): "The length of occupancy of the archipelago is of course bound up with the larger question of the age of man in South America." He adds that it is evident that the present Fuegians have lived in their present habitat a very long time, a judgment which rests firmly on three aspects of the shell mounds which abound in Fuegia.

To sum up, one may say that Cooper's work is far more than a mere bibliography. It is a guide, full and scholarly, to the literature of Fuegian anthropology; it is an outline of the chief cultural features of the Fuegians; and it is a work which all future students of the subject will have to regard as their source book if they are not to go astray.

PHILIP AINSWORTH MEANS

—— **Comodoro Rivadavia petroleum deposits.** Ills. *Bull. Pan Amer. Union,* Vol. 48, 1919, No. 2, pp. 177-182. Washington, D. C. [From *La Época,* Buenos Aires. Spanish version also in *Bol. Unión Panamericana,* Vol. 48, 1919, No. 2, pp. 183-190.]

KEIDEL, JUAN. **Sobre la nieve penitente de los Andes argentinos.** 84 pp.; diagrs., ills., bibliogr. *Anal. Minist. de Agric.: Sección de Geol., Mineral. y Minería,* Vol. 12, No. 4. Direcc. Gen. de Minas, Geol. e Hidrol., Buenos Aires, 1918. [The author's study of these interesting forms (now known to be in no sense peculiar to the southern Andes) leads him to the conclusion that neither wind nor ice movement produces these *penitentes,* but that they are the result solely of radiation brought to bear upon the ice surface from different angles with the daily and seasonal change of position of the sun.]

LARROUY, P. A. **Los indios del Valle de Catamarca: Estudio histórico.** 58 pp. (Facultad de Filosofía y Letras, Publ. de la Sección Antropológica No. 14). Reprinted from *Rev. Univ. de Buenos Aires,* Vol. 27, 1914.

—— **Lluvias in 1916.** 43 pp.; diagr. *Inst. Meteorol. y Geofísico de Chile, Sección Lluvias Publ. No. 23.* Santiago de Chile, 1917. [Also contains summaries covering the years 1849-1916.]

MORANDI, LUIS. **Frecuencia, cantidad y modalidades de la lluvia y del granizo en Villa Colón (Montevideo) en el período 1884-1914.** Diagrs. *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916,* Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 225-234. Washington, D. C., 1917.

MORANDI, LUIS. **Síntesis general de los resultados obtenidos desde su fundación y en sus distintos secciones y servicios en el Instituto Nacional Físico-Climato-**

lógico del Uruguay. Maps, diagrs. *Proc. 2nd Pan Amer. Sci. Congr., Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 779-824. Washington, D. C., 1917.

AFRICA

Atlas Region

Piquet, Victor. **Le Maroc: Géographie—histoire—mise en valeur.** xii and 464 pp.; maps. Librairie Armand Colin, Paris, 1917. 6 fr. 8 x 5.

The splendid task of French colonization in Morocco is described in these pages. The author, already known by his historical studies of northwestern Africa, begins with an account of the region's geology based on the geological explorations of the past twenty years and in particular on the geological work of Louis Gentil. He then considers the climate and soil. These physical foundations having been laid, he proceeds with the history of the country, dwelling specially on the development of Moroccan affairs in the critical years between 1904 and 1912.

The book is valuable because of the comparison it affords between the condition of Morocco and its inhabitants before and after French intervention. Few chapters in the annals of French colonization deserve wider publicity than General Lyautey's work in Morocco. In presenting a concise summary of this task of reorganization the author has paid due acknowledgment to the ability of his countrymen in converting an important section of Africa from an unruly state into one in which justice now prevails.

The last pages contain a detailed account of the results obtained through the replacement of the Moroccan system of administration by French institutions. A feature that deserves commendation in the book is the comprehensive treatment of the subject, the author having succeeded in bringing together the main data on the geography, history, and economic development of Morocco.

—— **Yebala y el bajo Lucus: Expedición de Abril-Junio de 1913.** xxxviii and 320 pp.; maps, diagrs., ills. Real Soc. Española de Hist. Nat., Madrid, 1914. 4 pesetas. 8½ x 6.

An account of the lower Lucus region. The physical geography of the Spanish zone in Morocco is described in detail. The importance of these studies is best appreciated by students of the structure of the Mediterranean basin. As a contribution to our knowledge of the tectonic relations between Europe and Africa the work is also of great value. Geographers no less than geologists will feel indebted to the Real Sociedad Española de Historia Natural, under whose auspices the field work was undertaken.

The first part comprises daily accounts for the entire itinerary. This diary is followed by chapters on vegetation and fauna in which agriculture is also considered. A final chapter on ethnography adds greatly to the value of the report. The author explains in his preface that these are all non-technical descriptions and that full accounts of the work and collections will appear in time in the *Boletín* and *Memorias* of the Society.

Aubry, ——. **L'élevage dans la région de Meknès.** *Bull. Soc. de Géogr. du Maroc*, Vol. 3, 1918, No. 5, pp. 39-54. Casablanca.

Ben Danou, C. **Contribution à l'étude de l'industrie pastorale en Algérie et au Maroc. Note sur les laines du Sud Oranais et du Maroc.** With a preface by —— Toupnot. Diagr. *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 36, 1916, No. 3-4, pp. 293-340.

Ben Danou Frères. **L'avenir de l'élevage et du commerce d'exportation du mouton. Abatage sur place et frigorification.** *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 37, 1917, No. 2, pp. 175-202.

Bernard, Augustin. **Nos grandes colonies et la guerre: Algérie.** *Rev. des Sci. Polit.*, Vol 36, 1916, August 15, pp. 1-29. Paris.

Bernard, Augustin, and Edmond Doutté. **L'habitation rurale des indigènes de l'Algérie.** Map. *Ann. de Géogr.*, No. 141, Vol. 26, 1917, pp. 219-228.

Bernard, François. **Le Maroc économique et agricole.** 212 pp.; map. Georges Masson, Paris, 1917. 4 fr. 10 x 6½.

BERTRAND, GUSTAVE, AND ÉTIENNE DELHOMME. **Notice sur El Ksar El Kebir et la région du Khlott (Maroc franco-espagnol).** *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 37, 1917, No. 3-4, pp. 217-255.

BESNARD, RENÉ. **Le rail dans l'Afrique du Nord.** Map. *Colonies et Marine*, Vol. 2, 1918, No. 7, pp. 162-185. Paris.

CAMPARDOU, J. **La grotte de Kifan bel Ghomari à Taza (Maroc).** Maps, ills. *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 37, 1917, No. 1, pp. 2-26.

CERECEDA, J. D. **La zone espagnole du Maroc.** Diagrs., ills. *Ann. de Géogr.*, No. 137, Vol. 25, 1916, pp. 366-373. [Abstracted in the *Review*, Vol. 3, 1916, p. 402.]

DÉCHAUD, E. **Une mission commerciale au Maroc.** *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 37, 1917, No. 1, pp. 27-102.

DEMONTÈS, VICTOR. **La Tunisie pendant la guerre.** *Bull. Soc. de Géogr. d'Alger et de l'Afrique du Nord*, Vol. 21, 1916, No. 1, pp. 26-76. Algiers.

DEMONTÈS, VICTOR. **Les lignites du Cap Bon.** Diagrs. *Bull. Soc. de Géogr. d'Alger et de l'Afrique du Nord*, Vol. 23, 1918, No. 2, pp. 151-198. Algiers.

DUPUY DE LÔME, E., J. M. DEL BOSCH, A. DEL VALLE, AND P. FERNANDEZ IRUEGAS. **Estudios relativos á la geología de Marruecos.** Maps, diagrs., ills. *Bol. Inst. Geol. de España*, Vol. 38 (Vol. 18, 2nd Ser.), 1917, pp. 15-254. Madrid. [The introduction by D. Agustín Marín, chief of the Commission, outlines the plan of work—which follows the course of pacification—and gives a résumé of the geology, hydrology, and mineralogy of the zones subsequently treated in detail—Melilla, the Atlantic zone from Larache to Tangier, the Mediterranean zone from Ceuta to Tetuán.]

FOURGOUS, J. **Le Maroc et son avenir économique.** Map, diagrs., ills. *Bull. Soc. de Géogr. de Toulouse*, Vol. 35, 1916, No. 2, pp. 191-219.

GALINIER, C. **Les Beni Mathar de Ras el Aïn (Berguent).** Maps. *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 37, 1917, No. 2, pp. 131-174.

GARDEY, ABEL. **Les ressources forestières du Maroc.** Map, ills. *Colonies et Marine*, Vol. 3, 1919, No. 1, pp. 33-40. Paris.

GAUTIER, E. F. **Le Chott Tigri.** Maps, ills. *Ann. de Géogr.*, No. 135, Vol. 25, 1916, pp. 181-189; No. 136, pp. 291-302.

GENTIL, LOUIS. **Esquisse hydrologique de la région de Meknès.** *Bull. Soc. de Géogr. Commerc. de Paris*, Vol. 36, 1914, June, pp. 385-397.

GENTIL, LOUIS. **Les analogies du Haut Atlas marocain et de l'Atlas saharien.** Reprint from *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 161, 1915, Aug. 2, pp. 103-105.

GENTIL, LOUIS. **Sur la structure de la zone littorale de l'Algérie occidentale.** Reprint from *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 156, 1913, March 25, pp. 965-968.

GENTIL, LOUIS. **Sur la tectonique du Haut Atlas marocain et ses relations avec l'Atlas saharien.** Reprint from *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 154, 1912, April 15, pp. 1011-1013.

GENTIL, LOUIS. **Sur l'origine des plis de l'Atlas saharien.** Diagr. Reprint from *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 154, 1912, April 29, pp. 1191-1193.

GENTIL, LOUIS, AND L. JOLEAUD. **Les nappes de charriage de l'Afrique du Nord.** Map. *Rev. Gén. des Sci.*, Vol. 29, 1918, Oct. 15, pp. 533-540. [On the overthrust folds in the Atlas system.]

GENTIL, LOUIS, AND PEREIRA DE SOUSA. **Sur les effets au Maroc du grand tremblement de terre en Portugal (1755).** Reprint from *Comptes Rendus de l'Acad. des Sci.* [*de Paris*], Vol. 157, 1913, Nov. 3, pp. 805-807.

JOANNIS, R. **Excursion aux grottes de Moulaï Ahmed ou du Zegzel (Maroc oriental).** Map, diagrs. *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 36, 1916, No. 3-4, pp. 278-284.

KŒCHLIN, RAYMOND. **Le Maroc en paix: Un coup d'œil d'ensemble.** *L'Afrique Française*, Vol. 26, 1916, No. 10-12, pp. 355-367. Paris.

MACLEOD, J. M. **The achievements of France in Morocco.** Maps, ills. *Geogr. Journ.*, Vol. 52, 1918, No. 2, pp. 84-105 (discussion, pp. 101-105).

—— **Maroc, Carnet des itinéraires principaux du.** Maps, indexes. Part I, Partie nord, 90 pp.; Part II, Partie sud-ouest, 127 pp.; Part III, Partie orientale, 72 pp. Bureau Topographique du Maroc, Casablanca, 1917. 2 fr. 50, 3 fr., 2 fr. 8 x 5½.

—— **Marruecos, La zona de influencia española en: Reseña geológica y descripción geográfica.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 15, 1918, No. 4-5, pp. 121-161; No. 6-7, pp. 201-242. Real Soc. Geogr., Madrid. [A review of "Estudios Relativos á la Geología de Marruecos," by E. Dupuy de Lôme and others, listed above.]

MARUCCHI, ANTONIO. **La granicultura nei territori dell'antica Africa Romana.** *L'Africa Italiana*, Vol. 35, 1916, No. 8, pp. 153-172. Naples.

MILLET, PHILIPPE. **Problems of French North Africa.** *Journ. Royal Soc. of Arts*, No. 3368, Vol. 65, 1917, pp. 515-525. London. [Abstracted in the *Review*, Vol. 5, 1918, p. 76.]

MOUREY, CHARLES. **Le commerce du Protectorat français du Maroc de 1913 à 1915.** *Renseign. Colon.* (*Suppl. à l'Afrique Française*), 1917, No. 3, pp. 49-62. Paris.

NAVARRO, L. F. **Expedición científica á la Península Yebálica.** 27 pp.; map, ills. Asociación Española para el Progreso de las Ciencias, Madrid, [1913]. [Northwestern Morocco; an address delivered at Madrid June 20, 1913.]

NAVARRO, L. F. **Observaciones geológicas en la isla de Gomera (Canarias).** 87 pp.; map, diagrs., ills. *Trab. Museo Nacl. de Cienc. Nat., Ser. Geol. No. 23.* Madrid, 1918.

NOËL, A.-H. **Documents pour servir à l'histoire des Hamyan et de la région qu'ils occupent.** Maps. *Bull. Trim. Soc. de Géogr. et d'Archéol. d'Oran*, Vol. 35, 1915, No. 2, pp. 121-197; No. 3-4, pp. 249-303; Vol. 36, 1916, No. 1, pp. 5-60; No. 2, pp. 117-192.

PERROT, CHARLES. **Forêts de la région Ito, Ifrane, Azroù et Aïn-Leuh.** Ills. *Bull. Soc. de Géogr. du Maroc*, Vol 3, 1918, No. 5, pp. 55-68. Casablanca.

REBOUL, ANDRÉ. **L'Azaghar de Tiznit.** Maps. *La Géographie*, Vol. 32, 1918, No. 1, pp. 1-9. Paris. [A plain at the foot of the Anti-Atlas south of Agadir. The region is poor and scantily watered, but the geological structure permits a hope of obtaining abundant subterranean sources whereby irrigation could be practiced.]

S—, R. DE. **Le Sud Marocain.** *Renseign. Colon.* (*Suppl. à l'Afrique Française*), 1917, No. 5-6, pp. 130-137. Paris.

SALTER, J. H. **Regional distribution of the native flora in Teneriffe.** Ills., bibliogr. *Memoirs and Proc. Manchester Literary & Philos. Soc.*, Vol. 62, 1917-18, Part III, No. 8, pp. 1-16.

EAST AFRICA

DRACOPOLI, I. N. **Through Jubaland to the Lorian Swamp: An adventurous journey of exploration and sport in the unknown African forests and deserts of Jubaland to the unexplored Lorian Swamp.** 318 pp.; maps, ills.; index. Seeley, Service & Co., Ltd., London, 1914. 10s. 6d. 9 x 6.

Jubaland is the northern region of British East Africa and the southern part of the still largely unknown country extending southward from Abyssinia. Dracopoli is the only explorer who has penetrated this part of Africa between 41°30′ E. and the Lorian Swamp. About two-thirds of his route survey from the Indian Ocean to the Lorian Swamp was thus through unknown country.

The explorer entered Jubaland at the port of Kismayu; his destination was the Lorian Swamp, about 300 miles inland, but his circuitous route added much to the length of his journey. Behind the coastal sands most of the country is covered with gray thorn bushes, difficult to travel through, interspersed with vast patches of reeds, 12 to 14 feet high, and occasional flat meadowland, green during the torrential rains. There are no mountains, rivers, or lakes; monotony is the keynote of the land. The scrub rising above the heads of the men completely obscures the view but is no protection against the burning sun. The ground is so hot at times as to be painful even through thick boots, and at the same time the humidity is great. Dracopoli regards the climate of Jubaland as distinctly unhealthful. Only three of his twenty-six men escaped attacks of malarial fever. The author calls this large region the East Africa desert jungle. Its only inhabitants are elephants, giraffes, dik-dik, a small variety of the antelope family, and birds. Along the western fourth of the journey, leading

nearly to the mountains from which the Lorian Swamp derives its waters, the whole region is fairly well watered, and a considerable variety of African game is found.

The Somali live to the west of the desert region, along the upper Dera River, the outlet of the Lorian Swamp, and farther west, where there is forage for their cattle. No agriculture is found because the water supply, even there, is intermittent; and so the Somali wander from place to place seeking the best grazing and abundant water. More of them are moving into the country from the north. Perhaps the motive for this migration is to escape the troublous conditions that the remarkable régime of the Mad Mullah has imposed upon so much of Somaliland.

Dracopoli has cleared up the geography of the Lorian Swamp region, and this is one of his best geographical results. East of the Marti Plateau there are three slight depressions of the land through which the Uaso Nyiro flows, and a swamp occupies each depression. The central swamp is the Lorian, many times the largest, with a circumference of about fifty miles. The river flows in large volume through it, and its borders are banked by tall grasses and reeds. The land around the swamp is a rich alluvial plain that may easily be irrigated from the river. The author says that rice, cotton, and sugar would thrive well on this plain.

The book contains much scientific information and is also adapted to sustain the interest of any intelligent reader. Its map contains good material for the improvement of our atlases, including contours of elevation, along the route, at 100-foot intervals, showing the very gradual rise of the plain from sea level to 1,400 feet at the Marti Plateau in the west. CYRUS C. ADAMS

BRIEY, RENAUD DE. **Belgium and Germany in Africa.** Map, diagr., ills. *Geogr. Journ.*, Vol. 51, 1918, No. 5, pp. 293-306 (discussion, pp. 303-306). [In 1917 the Comte de Briey was sent on an official mission to German East Africa. He here gives notes on the western and northwestern portions of the country, i. e. along the central railroad and in Ruanda. Construction of the central railroad produced as powerful an economic effect on the country as the building of the Uganda Railroad did in British East Africa. This is shown in a graph. As soon as the railroad reached Tabora it began to exert a wide sphere of attraction, being very strongly felt in the Victoria Nyanza region. It is well known that the German economists aimed at tapping Katanga and in general making the Belgian Congo an economic hinterland of the German colony. *Le Mouvement Géographique* for June 7, 1914, published an interesting expression of this intention. Comte de Briey's article is accompanied by a hypsometrical map of the northwestern portion of German East Africa.]

CANA, F. R. **Frontiers of German East Africa.** Map. *Geogr. Journ.*, Vol. 47, 1916, No. 4, pp. 297-303.

GUIDI, IGNAZIO. **Le popolazioni delle colonie Italiane.** 14 pp. *Minist. delle Colonie Rapporti e Monografie Coloniali No. 10.* Direz. Centrale degli Affari Coloniali. Rome, 1913.

PALAZZO, L. **La distribuzione della forza magnetica terrestre nella media Eritrea.** Map. Reprint from *Rendiconti della R. Accad. dei Lincei: Classe di sci. fis., mat. e nat.*, Vol. 24, 1915, No. 1, pp. 48-54. Rome.

SHARPE, ALFRED. **Reconstruction in eastern Africa.** Map. *Scottish Geogr. Mag.*, Vol. 34, 1918, No. 7, pp. 241-251. [Suggests that the anomaly of separate administration for British East Africa and Uganda should be rectified. The suggestion is carried further in the proposal for centralizing authority here by the appointment of one Governor General for all British territory north of the Zambesi and south of the Sudan. Whatever the fate of German East Africa, certain rectifications of frontier are desired—certain sections of the northern part of the colony, including Ruanda, Kilimanjaro, and Usambara to the contiguous British areas, Kondeland in the south to Nyasaland. Problems in transportation, government, lands, and native questions, including labor, are also touched upon.]

SMUTS, J. C. **East Africa.** Map, ill. *Geogr. Journ.*, Vol. 51, 1918, No. 3, pp. 129-149 (discussion, pp. 145-149). [After describing the geographical features that loomed large in the East African campaign, General Smuts refers to certain considerations, economic and political, that affect the future of the country. He doubts whether East and Central Africa will ever become a white man's country in any real sense. Germany, however, has never encouraged any movement in this direction in her protectorate but has slighted the white settler with the small farm for the capitalist planter. The German theory of colonization, moreover, has its militaristic basis: this is revealed in the German schemes of a "Mittelafrika." General Smuts's paper is fortunately illustrated by a

hypsometric map showing the 200-meter contour and contours at 500-meter intervals. The same issue of the *Geographical Journal* also contains "Notes on the South-Western Area of 'German' East Africa" by Owen Letcher.]

TOBLER-WOLFF, GERTRUD, AND F. TOBLER. **Vegetationsbilder vom Kilimandscharo.** 24 pp.; map, ills. (Vegetationsbilder, Ser. 12, No. 2-3. Herausgegeben von G. Karsten and H. Schenck.) Gustav Fischer, Jena, 1914.

WOODHOUSE, C. W. **Game and war.** Map. *Journ. East Africa and Uganda Nat. Hist. Soc.*, Vol. 5, 1916, No. 10, pp. 71-76. London. [The article deals with observations made in and prior to the war and during the first year of hostilities in British East Africa. The disturbance to local fauna has involved actual destruction and change in feeding grounds; but, with the probable exception of the rhinoceros, loss is believed to be merely temporary. Effect on migrations is well illustrated in the case of the elephant, which normally moves eastward from Kilimanjaro with the beginning of the long rains of spring. During 1914 the movement was as usual, but during 1915 only a few stray herds were reported in their usual habitats. The line of migrations is shown in a map accompanying the article.]

ASIA

MANCHURIA, KOREA, JAPAN

OMORI, F. **The Sakura-jima eruptions and earthquakes: Course of activity in the Sakura-jima eruption of 1914.** Maps, diagrs., ills. *Bull. Imp. Earthquake Investigation Committee*, Vol. 8, 1916, No. 3, pp. 181-321. Tokyo.

Besides the expectable features in this report there are several points of special interest. The sketches and maps are well made, many of the descriptions have broad physiographic interest, and the photographs are among the very best that have ever been published in the field of vulcanology. It would be difficult to find elsewhere photographs which could compare with Figure 35, showing a floating pumice layer outside the harbor of Kagoshima; or the admirable view, Figure 8, taken about one hour after the beginning of the eruption of Sakura-jima; or the phenomena exhibited by craterlets in Figures 86 and 91. Not the least striking is Figure 127, showing the vigorous evaporation of sea water at the edge of a broad and fresh lava flow.

—— **Chosen, Results of the meteorological observations made at, for the lustrum 1911-1915.** 27 pp. Meteorol. Observatory of the Government-General of Chosen, Jinsen (Chemulpo), 1917.

HANABUSA, NAOSABURO. **Graphiques statistiques sur l'état de la population de l'Empire du Japon.** 25 pp.; maps, diagrs. Bur. de la Statistique Générale, Cabinet Impérial, Tokyo, 1916.

HANABUSA, NAOSABURO. **Résumé statistique de l'Empire du Japon. Vol. 30.** xvi and 225 pp.; diagrs. Bur. de la Statistique Générale, Cabinet Impérial, Tokyo, 1916. 2.66 yen. 10 x 7.

ISHII, SHINJI. **The island of Formosa and its primitive inhabitants.** Map, ills. *Trans. and Proc. Japan Soc.*, Vol. 14, 1915-16, pp. 38-60. London.

KOTÔ, BUNDJIRÔ. **The great eruption of Sakura-jima in 1914.** 237 pp.; maps, diagrs., ills., index. *Journ. College of Sci., Tokyo Imp. Univ.*, Vol. 38, 1916, Art. 3. Tokyo.

—— **Manchuria and Korea, The railways of.** Maps, ills. *Far Eastern Rev.*, Vol. 14, 1918, No. 4, pp. 143-153. Shanghai.

—— **North Manchuria, New railways in: Russia consolidates her position.** Map, ills. *Far Eastern Rev.*, Vol. 12, 1916, No. 11, pp. 415-419. Shanghai. [For comment see note on "Proposed New Railroads in the Russian Empire" in the *Review*, Vol. 2, 1916, p. 472.]

ÔINOUYE, Y. **A few interesting phenomena on the eruption of Usu.** Map, diagrs., ills. *Journ. of Geol.*, Vol. 25, 1917, No. 3, pp. 258-288.

SIMOTOMAI, H[IDEZÔ]. **Der vulkanische Kessel Kutscharo.** Map. *Zeitschr. für Vulkanologie*, Vol. 2, 1916, No. 3, pp. 137-139. Berlin.

SIMOTOMAI, HIDEZÔ. **Physiographic development of the Tarumai dome in Japan.** Maps, diagrs., ills., bibliogr. *Amer. Journ. of Sci.*, No. 260, Ser. 4, Vol. 44, 1917, pp. 87-97.

SIMOTOMAI, H[IDEZÔ]. **Vergleichende Übersicht der vulkanischen Tätigkeit der Fuji- und Kirishima-Vulkanzonen in Japan.** Map. *Zeitschr. für Vulkanologie*, Vol. 2, 1916, No. 3, pp. 129-137. Berlin.

TORII, R. **Études archéologiques et ethnologiques: Populations préhistoriques de la Mandchourie méridionale.** 80 pp.; map, diagrs., ills. *Journ. College of Sci., Tokyo Imp. Univ.*, Vol. 36, 1915, Art. 8. [From 1895 to 1913 the Anthropological Society of Tokyo carried out a series of five explorations in Manchuria and adjacent territories. The volume in hand pertains to the Liaotung Peninsula and the basin of the lower Liao River.]

WESTON, WALTER. **Exploration in the northern Japanese Alps.** Ills. *Geogr. Journ.*, Vol. 46, 1915, No. 3, pp. 188-200. [Read before the Royal Geographical Society, May 31, 1915. An abridgment, entitled "Recent Explorations in the Japanese Alps," was published in *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 7, pp. 306-315. Under the first title a different paper (read before the Alpine Club, June 1, 1915) was published in *Alpine Journ.*, No. 213, Vol. 30, 1916, pp. 246-259.]

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

MJÖBERG, ERIC. **Bland vilda djur och folk i Australien.** 524 pp.; maps, ills., index. Albert Bonniers Förlag, Stockholm, 1915. 15 kroner. 9½ x 6½.

"Among Wild Animals and People in Australia" is the title of the present volume by the Swedish explorer, Eric Mjöberg. It is an account of his trip through the hitherto unexplored regions of the Kimberley District in Western Australia, in 1910 and 1911. Several large public and private stipends granted the author in his native land made it possible for him to carry a very complete outfit, and the loan of a large bullock wagon and span of twenty oxen by the Australian government facilitated the transport.

The journey into the interior began on October 26, 1910, from Derby on King Sound. After passing through a dreary stretch of bush, the party crossed the Grant Range and journeyed across a rocky plateau to Noonkanbah sheep station. At this little group of corrugated iron houses, the center of a flock of ten thousand sheep, Dr. Mjöberg unloaded his wagon and proceeded to make various excursions in the nearby mountains. Not far away lies Skeleton Hill, where the natives still "bury" their dead by tying the body to a bier of branches and placing it in a tree top. He succeeded in carrying away several complete skeletons and in taking numerous interesting photographs of this strange cemetery.

The study of the Australian aborigines is of especial importance, since they are a rapidly dying race. In spite of the efforts of the government, syphilis and tuberculosis work great havoc among them, and in a few generations they may have disappeared entirely. Peculiar interest attaches also to the flora and fauna of Australia. The continent has been called a great open-air museum for living antiquities. Scientists hold that, in the Cretaceous period, Asia was completely separated from Australia and that the latter pursued an independent development, which, however, lags far behind that of the rest of the world. Specimens from the Tertiary and even from the Cretaceous period are still extant. For instance, the pouched animal or marsupial was once prevalent all over the world, but in the other continents it has given place to more highly organized species. In Australia the marsupial may still be studied in all its variants, the most important being, of course, the kangaroo. On the other hand, the author calls attention to the fact that no important edible plant and no domestic animal in common use has originated in Australia. This he believes to be one reason for the low state of the Australian natives, who have never learned to harness nature. He declares that in many places they do not even know how to make the mental connection between plant and seed. Yet they seem in every way normal; their senses are highly developed, and they have originated the most curious of all weapons, the boomerang.

Dr. Mjöberg was himself in charge of the zoölogic and botanical researches of the expedition as well as the anthropologic and ethnographic, including the task of collecting skeletons. In his ethnographic investigations he was assisted by Mr. Yngve Laurell. His other two white companions were Mr. Rudolf Söderberg, the ornithologist of the expedition, and Mr. Cyrus Videll, who did the work of preservation. The results of the expedition included many thousands of specimens of vertebrate and invertebrate animals carefully preserved. A number of valuable photographs were taken. The book has two hundred and thirty illustrations, a few of these being in color.

Returning to Derby in April, 1911, the author afterwards spent some time in coast and marine investigations in Dampier Land before departing for Sweden.

HANNA ASTRUP LARSEN

REID, A. MCI. **The North Pieman and Huskisson and Sterling Valley mining fields.** vi and 132 pp.; maps, diagrs., ills. *Geol. Survey of Tasmania Bull. No. 25.* Hobart, 1918. [Some twenty pages of this Bulletin are devoted to a geographical description of the area, one of the most rugged portions of the west coast division, concerning which no detailed account has hitherto been published.]

—— **South Australian Museum expedition to Strzelecki and Cooper Creeks, September and October, 1916, Results of the.** Maps, ills. E. R. WAITE: **Introduction, Narrative, General notes, Meteorology,** pp. 405-424; H. A. HUNT: **Notes on the rainfall,** pp. 424-429; E. R. WAITE: **The natives, Mammalia and Ophidia,** pp. 429-440; S. A. WHITE: **Aves,** pp. 441-466; A. M. LEA: **Stomach contents of birds,** pp. 466-468; F. R. ZIETZ: **Lacertilia,** pp. 469-472; A. R. MCCULLOCH AND E. R. WAITE: **Pisces,** pp. 472-475; CHARLES CHILTON: **Crustacea,** pp. 475-482; W. J. RAINBOW: **Araneidae,** pp. 482-489; A. M. LEA: **Insecta,** pp. 489-630; J. M. BLACK: **Botany,** pp. 631-658. *Trans. and Proc. Royal Soc. of South Australia,* Vol. 41, 1917, pp. 405-658. Adelaide. [Notes on the desert and semi-arid region east of Lake Eyre.]

TEALE, E. O. **Soil survey and forest physiography of Kuitpo, South Australia.** 19 pp.; maps, diagrs. *Univ. of Adelaide Dept. of Forestry Bull. No. 6.* Adelaide, 1918.

WHITE, S. A. **Scientific notes on an expedition into the northwestern regions of South Australia.** Maps, ills. *Trans. and Proc. Royal Soc. of South Australia,* Vol. 39, 1915, pp. 707-842. Adelaide. [In the capacity of biologist the author accompanied the reconnaissance expedition of 1914 organized by the Geological Survey of South Australia. This expedition was noted in the Record item "A Proposed Expansion of the Pastoral Industry of South Australia," *Geogr. Rev.,* Vol. 1, 1916, p. 377.]

WHITE, S. A. **The flora of the country between Oodnadatta and the Musgrave and Everard Ranges.** *Geol. Survey of South Australia Bull. No. 5,* pp. 55-57. Adelaide, 1915.

WOODWARD, H. P. **The coal resources of Western Australia.** Maps. *Geol. Survey of Western Australia Bull. No. 64,* pp. 7-12. Perth, 1915. ["Written for the International Geological Congress, Canada, 1913."]

WOOLNOUGH, W. G. **The physiographic significance of laterite in Western Australia.** Map, diagr. *Geol. Mag.,* Decade 6, Vol. 5, 1918, No. 9, pp. 385-393. London.

—— ***Australia, Rain map of, for the year 1917.*** [1:8,500,000 approx.] On reverse side: maps, 1:32,000,000, showing the rainfall for each month during 1917. (The figures are based on the daily reporting stations and are therefore only approximate.) [Central Weather Bureau], Melbourne, 1918. [For additional comment see Record item "Rainfall Maps of Australia", *Geogr. Rev.,* Vol. 6, 1918, p. 373.]

FOX, H. W. ***Geological sketch map of Queensland, showing mineral localities.*** [1 in to 39 miles, or 1:2,500,000.] 3rd edit., revised to 1907. *Geol. Survey of Queensland Publ. No. 217.* Brisbane, 1907.

—— ***South Australia*** [***showing land elevations.***] [1:3,000,000.] Geological Survey, Adelaide, 1917.

OCEANS

SCHOTT, G., B. SCHULTZ, AND P. PERLEWITZ. **Die Forschungsreise S. M. S. "Möwe" im Jahre 1911.** vi and 104 pp.; maps, diagrs., ill. *Aus dem Archiv der Deutschen Seewarte,* Vol. 37, 1914, No. 1. Hamburg.

This paper presents the physical observations obtained during the period from May to October, 1911, in a coastal belt 250 miles wide off the west coast of Africa from Cadiz, 35° N., to Cape Town, 33° S. Surface water samples were taken twice a day for accurate salinity determinations, and the usual meteorological observations and surface temperatures were taken every four hours. At 59 stations serial observations of temperature and salinity from the surface to the bottom were made, and the surface current was estimated from angular measurements relative to a float. At 30 stations the Ekman current meter was used at depths less than 100 meters. Careful determinations of the ship's position at noon from astronomical observations, and from the log and course, gave estimates of the current in fair agreement with the other method. In order to determine the variation of the biological facies of the bottom with respect to the varying physical conditions from shallow to deep water, samples were collected at each station. A limited amount of aerological work was done with the aid of kites and sounding balloons.

Three regions, the northern, middle or equatorial, and southern, corresponding respectively to the Canary, Guinea, and Benguela Currents, are discussed separately because of the great difference in their physical conditions. Serial observations of temperature and salinity were made along two sections perpendicular to the coast in the northern region and three in the southern one, and also along a longitudinal section of each region.

Because of the upwelling of cold bottom water, the northern region is characterized by an increase of temperature from the coast, where it is 1° C. below the normal, and a very small north-to-south temperature gradient. The air temperature is 1° C. above that of the water. Strong northwest winds (4 Beaufort), usually accompanied by a strong southerly surface current (0.5 to 1.5 miles per hour), prevail. The flow from the Mediterranean gives rise to high temperatures and salinities below 600 meters in the northern part. The salinity of the upper 50 meters increases as the distance from the coast increases.

In the middle or equatorial region high surface temperatures (25° C.) and an excess of water over air temperatures prevail, but water temperatures below 20° C. occur in a limited upwelling region near Lome only 7° from the equator. Along the part of the coast running east and west is a strong surface current (1 mile per hour) toward the northwest except near Lome, where it is parallel to the coast. Southwest winds (3 Beaufort) prevail.

The southern region is characterized by low surface temperatures, due to upwelling. The prevailing drift is to the northwest at the rate of 0.2 to 1.5 miles per hour, and the prevailing wind is from the southwest (4 Beaufort).

The observed change in direction and velocity with respect to depth accords qualitatively with Ekman's theory of currents due to wind. In general no marked divergence from former observations appears. GEORGE F. MCEWEN

HEPWORTH, M. W. C. **The relation between pressure, temperature, and air circulation over the South Atlantic Ocean.** 2nd edit. 14 pp.; maps, index. *M[eteorol]. O[ffice Publ. No]. 177.* Meteorological Office, London, 1917. 1s. 9½ x 6. [New edition of notes published in 1904, with pressure readings corrected for latitude in accord with international convention and expressed in millibars.]

MACGREGOR, WILLIAM. **The settlement of the Pacific.** *Scottish Geogr. Mag.*, Vol. 34, 1918, No. 5, pp. 161-177.

—— **Océan Indien I', Observations océanographiques et météorologiques dans; Septembre, Octobre, Novembre (1856-1914).** xi and 240 pp.; maps, diagrs. *Kon. Nederl. Meteorol. Inst.* [*Publ.*] *No. 104.* Utrecht, 1915. [With charts.]

RYDER, C. **Monthly mean temperatures of the surface water in the Atlantic, north of 50° N. lat.** 21 pp.; maps, diagrs. Appendix to the *Nautical Meteorological Annual*, Dansk Meteorol. Inst., Copenhagen, 1917. [The charts have been drawn upon the basis of observations from Danish vessels made during the years 1876-1915, supplemented by data from various published sources. An important feature is the division of the material into decades, whence, among other advantages, it will be the more readily adaptable for use in the study of climatic change.]

WORLD AS A WHOLE AND LARGER PARTS

HARING, C. H. **Trade and navigation between Spain and the Indies in the time of the Hapsburgs.** xxviii and 371 pp.; map, bibliogr., index. (Harvard Economic Studies, Vol. 19.) Harvard University Press, Cambridge, 1918. $2.25. 9 x 6.

For many years students of the colonization of the New World have felt the want for a book of just the kind that has been brought out by Professor Haring. It is almost impossible to understand the commercial features of the Spanish Conquest of the Americas without making laborious search throughout the records. This search frequently entails the consultation of hundreds of books and pamphlets. Thanks to the author of this volume, one now has a handbook on the subject which is not only authoritative but unique.

The volume is divided into two parts, the first part dealing with the trade created and the second part with the various matters pertaining to navigation of ships between Spain and the Americas. Step by step, the author traces the development of commerce, from the beginnings of the American trade until the institution of the Casa de Contratación. This powerful organization held approximately the same position in Spain as subsequently did the Dutch East India and the Dutch West India Companies in the Netherlands. The ordinances and royal decrees conferring various powers upon the

Casa de Contratación are traced in chronological order, as are the laws and judgments promulgated by the Council of the Indies. The regulations regarding the working of mines within the jurisdiction of the Spanish Crown in the West Indies and South America throw an interesting light upon the grasping policy of the Court. We find a lengthy and valuable discussion on the use of quicksilver in the extraction of silver, a process that was first discovered by a Mexican miner in 1556. Not only did the Crown derive its royal percentage of all silver mined, but it additionally declared the sale of quicksilver to be a royal monopoly, thereby creating two profits on all mining operations.

The second part of the book, on navigation, can unhesitatingly be said to contain the most exhaustive information on ships and their management in the sixteenth and seventeenth centuries of all monographs on the subject. This part discusses the kind of ships of that epoch, the various inspections and the regulations regarding the fitting out of craft designed for oversea traffic and even gives figures showing the pay received not only by the crew but by the higher officials appointed by the Crown. A noteworthy fact as giving an insight into the jealous care with which the Spanish sovereigns guarded their prerogatives was the appointment of a *veedor*, a sort of king's attorney, to each fleet leaving home waters, whose duties consisted in seeing that "all laws and ordinances regarding the management and governance of the fleet were observed, and that each man performed his duties, from the captain general down to the least of the commissioned officers. . . . He was at the general's side during the inspections and musters, a sort of royal watchdog for all occasions."

The organization of convoys for transmission of the wealth of the Indies to Spain is discussed at length, and the reasons for the easy capture of many of the more important South American and West Indian towns, such as Cartagena, Panama, and Havana, by pirates and freebooters, are explained. It is shown how the French, English, and Dutch privateers, the latter two named "Lutheran Corsairs" by their Spanish adversaries, were finally responsible for the collapse of the commercial edifice the Casa de Contratación had so carefully erected. That a great deal of this decline was directly due to a penurious policy of the home government, which would not devote sufficient funds for the fortification of its principal strongholds in the Americas, can be judged from the angry protests of the colonists, whose cities were often without the most elementary means of defending themselves against foreign invaders. As a result, the amount of tribute paid to besieging privateers by the more exposed cities amounted to incredible sums.

A very complete, classified bibliography is found at the beginning of the volume and is of high value to students of this epoch. THEODOOR DE BOOY

CONSCIENCIA, M. S. **Navegaçao luso-americana.** 89 pp.; map, ills. Soc. de Geogr. de Lisboa, Lisbon, 1916.

COOK, O. F., AND R. C. COOK. **The maho, or mahagua, as a trans-Pacific plant.** *Journ. Washington [D. C.] Acad. of Sci.*, Vol. 8, 1918, No. 6, pp. 153-170. Easton, Pa. [The maho, a useful tree providing primitive man with fiber, bark cloth, and wood for the kindling of fire, is of interest as a clue in the inquiry concerning contact between the Pacific Islanders and pre-Columbian America. The maho is considered to be a native of America, but it appears to have been distributed over the islands and shores of the Pacific and Indian Oceans before the arrival of Europeans. Supporting the evidence from cultivation is the close similarity between Peruvian and Polynesian names of the tree.]

HOSSEUS, C. C. **Vergleichende Studien alt- und neuweltlicher Vegetation der Gebirge.** *Zeitschr. des Deutschen Wiss. Vereins zur Kultur- und Landeskunde Argentiniens*, Vol. 1, 1915, No. 2, pp. 81-107. Buenos Aires.

LYONS, H. G. **The meteorological resources of the Empire.** Map. *Quart. Journ. Royal Meteorol. Soc.*, No. 186, Vol. 44, 1918, pp. 70-89. [Presidential address, at the annual general meeting, Jan. 16, 1918. A map shows the distribution of climatological stations throughout British possessions.]

NAÓN, R. S. **The European War and Pan Americanism.** *Columbia Univ. Quart.*, Vol. 21, 1919, No. 2, pp. 85-97. New York. [This writer, for six years Argentine Ambassador to the United States, believes that geographical, economic, and psychological factors make an effective league of nations impossible at the present time but that the same factors favor the development of Pan-Americanism, upon which, as a model, may later be reared a comprehensive world union.]

PARRISH, S. L. **Self-government in the tropics.** 10 pp. *Senate Doc. No. 364, 64th Congr., 1st Sess.* Washington, D. C., 1916.

MATHEMATICAL GEOGRAPHY

Astronomical Geography

Boccardi, Giovanni. **Lezioni di cosmografia.** ix and 233 pp.; maps, diagrs., index. (Manuali Hoepli.) Ulrico Hoepli, Milan, 1916. 6 x 4.

Chamberlin, T. C. **The planetesimal hypothesis.** Reprint from *Scientia*, Vol. 16, 1914, pp. 165-186. Bologna.

Foerster, Wilhelm. **Kalenderwesen und Kalenderreform.** 49 pp. (Sammlung Vieweg: Tagesfragen aus den Gebieten der Naturwissenschaften und der Technik, No. 13.) Friedr. Vieweg & Sohn, Brunswick, 1914. M. 1.60. 9 x 6.

Hills, E. H. **The movements of the earth's pole.** Diagrs. *Nature*, No. 2443, Vol. 97, 1916, Aug. 24, pp. 530-535.

Larmor, Joseph, and N. Yamaga. **On permanent periodicity in sunspots.** Diagrs. *Proc. Royal Soc.*, No. 654, Ser. A, Vol. 93, 1917, pp. 493-506. London.

Marvin, C. F. **Diagrams showing conditions and effects of the daylight-saving act.** Diagrs. *Monthly Weather Rev.*, Vol. 46, 1918, No. 2, p. 76. Washington, D. C. [See the note in the November, 1918, *Review*, pp. 449-450, with sample diagram reproduced for latitude 42°; also diagram for latitude 60° in the March, 1919, *Journ. of Geogr.*, p. 115.]

Przybyllok, E. **Die Polhöhenschwankungen.** 41 pp.; diagrs., ills. (Sammlung Vieweg: Tagesfragen aus den Gebieten der Naturwissenschaften und der Technik, No. 11.) Friedr. Vieweg & Sohn, Brunswick, 1914. M. 1.60. 9 x 5½.

—— **Total eclipse of the sun, June 18, 1918.** 32 pp.; maps. *Suppl. to the American Ephemeris, 1918.* Nautical Almanac Office, U. S. Naval Observatory, Washington, D. C., 1917.

PHYSICAL GEOGRAPHY

Geology and Geomorphology

Carandell, Juan, and Bartolomé Darder. **Apuntes sobre el origen de las montañas.** Diagrs. Reprinted from *Bol. Real Soc. Española de Hist. Nat.*, Vol. 18, 1918, pp. 282-290. Madrid.

Davis, W. M. **Coral reefs and submarine banks.** Diagrs. *Journ. of Geol.*, Vol. 26, 1918, No. 3, pp. 198-223; No. 4, pp. 289-309; No. 5, pp. 385-411.

Emerson, B. K. **Recurrent tetrahedral deformations and intercontinental torsions.** Map. *Proc. Amer. Philos. Soc.*, Vol. 56, 1917, No. 6, pp. 445-472. Philadelphia.

Emmons, W. H. **The principles of economic geology.** xviii and 606 pp.; maps, diagrs., ills., index. McGraw-Hill Book Co., Inc., New York, 1918. $4.00. 9 x 6.

Iddings, J. P. **The problem of volcanism.** xvi and 273 pp.; map, diagrs., ills., index. (Mrs. Hepsa Ely Silliman Memorial Lectures, Vol. 12.) Yale University, New Haven, 1914. $5.00. 9½ x 6½.

Jackson, J. W. **The association of facetted pebbles with glacial deposits.** Ills. *Memoirs and Proc. Manchester Literary & Philos. Soc.*, Vol. 62, 1917-18, Part III, No. 9, pp. 1-15.

Jehu, T. J. **Rock-boring organisms as agents in coast erosion.** Ills. *Scottish Geogr. Mag.*, Vol. 34, 1918, No. 1, pp. 1-11.

Kindle, E. M. **Recent and fossil ripple-mark.** iii and 121 pp.; diagrs., ills. *Geol. Survey of Canada Museum Bull. No. 25: Geol. Ser. No. 34.* Ottawa, 1917. [A descriptive study of "the phases of ripple-mark phenomena met with on sandy sediments and their correlation with the geologic agencies which produce them." The study is illustrated by admirable "photographs and profiles from casts of plaster of Paris moulds taken directly from ripple-mark shortly after its formation and from fossil ripple-mark."]

Mohorovičić, A. **Die Bestimmung des Epizentrums eines Nahbebens.** *Beiträge zur Geophysik: Zeitschr. für Physikalische Erdkunde*, Vol. 14, 1916, No. 3, pp. 199-205. Leipzig.

Mohorovičić, S. **Die reduzierte Laufzeitkurve und die Abhängigkeit der Herdtiefe eines Bebens von der Entfernung des Inflexionspunktes der primären Laufzeitkurve.** Diagrs. *Beiträge zur Geophysik: Zeitschr. für Physikalische Erdkunde*, Vol. 14, 1916, No. 3, pp. 187-198. Leipzig.

MORRISON, J. T. **On the internal structure of the earth.** Diagrs. *South African Journ. of Sci.*, Vol. 15, 1918, No. 2, pp. 31-44. Cape Town.

OLDHAM, R. D. **The interior of the earth.** *Geol. Mag.*, Decade 6, Vol. 6, 1919, No. 1, pp. 18-27. London.

RUEDEMANN, RUDOLF. **On some fundamentals of Pre-Cambrian paleogeography.** Map. *Proc. Natl. Acad. of Sci.*, Vol. 5, 1919, No. 1, pp. 1-6. Baltimore.

HYDROGRAPHY AND OCEANOGRAPHY

MCEWEN, G. F. **Oceanic circulation and its bearing upon attempts to make seasonal weather forecasts.** 20 pp.; bibliogr. *Bull. Scripps Inst. for Biol. Research No. 7.* [Berkeley, Cal.], 1918.

This paper epitomizes for the general reader the development of methods of observing oceanic circulation, the evolution of ideas thereof, and their relation to problems of meteorology. The first serious theory of oceanic circulation was formulated by Leonardo da Vinci in 1500. He wrote that the water of the torrid zone was reduced in density by the high temperature, thus giving rise to a deep undercurrent flowing from the poles to replace the surface water flowing out from the equator. In the seventeenth century, when the winds and ocean currents over most of the globe were known to some extent, it became apparent that the winds moved the surface waters of the oceans and were largely responsible for the ocean currents. By the early part of the nineteenth century much more accurate information concerning ocean currents was at hand, chiefly through Captain Cook's discoveries, the use of the chronometer (making possible the accurate location of vessels at sea), and the extensive employment of bottles. Franklin, in 1775, made the first temperature observations in the Gulf Stream and was the first to apply such observations to practical problems of navigation (cf. *Geogr. Rev.*, Vol. 4, 1917, p. 201, footnote). Humboldt, in 1814, published a detailed and accurate description of the currents in the North Atlantic. He appreciated the essentially variable character of ocean currents and, consequently, saw the need of continuous observations the year round. Following Rennell, who espoused the theory of the winds as the chief cause of oceanic circulation, and Arago, who first emphasized the importance of the deflective effect of the earth's rotation, Humboldt, in 1845, expressed his belief that several causes of ocean currents must be considered simultaneously. Maury, in 1850, held that the prevailing drift was the result of differences in density and that the motion thus produced might be modified by winds, rain, barometric pressure, and evaporation.

During the past few decades the application of the results of hydrodynamical laboratory observations and theories to explain the complex movements of ocean waters has largely failed to be conclusive. It is now generally admitted that ocean currents are due to various external forces—the wind or friction of a neighboring current, differences in pressure resulting from evaporation, precipitation, and differences in specific gravity —and are modified by the deflecting force due to the earth's rotation and by the internal friction of water. In studying an ocean current it is thus best to think of it as the sum of many components due to many different causes, both internal and external. The subject is so vast and complex that only through international co-operation can rapid advances be made.

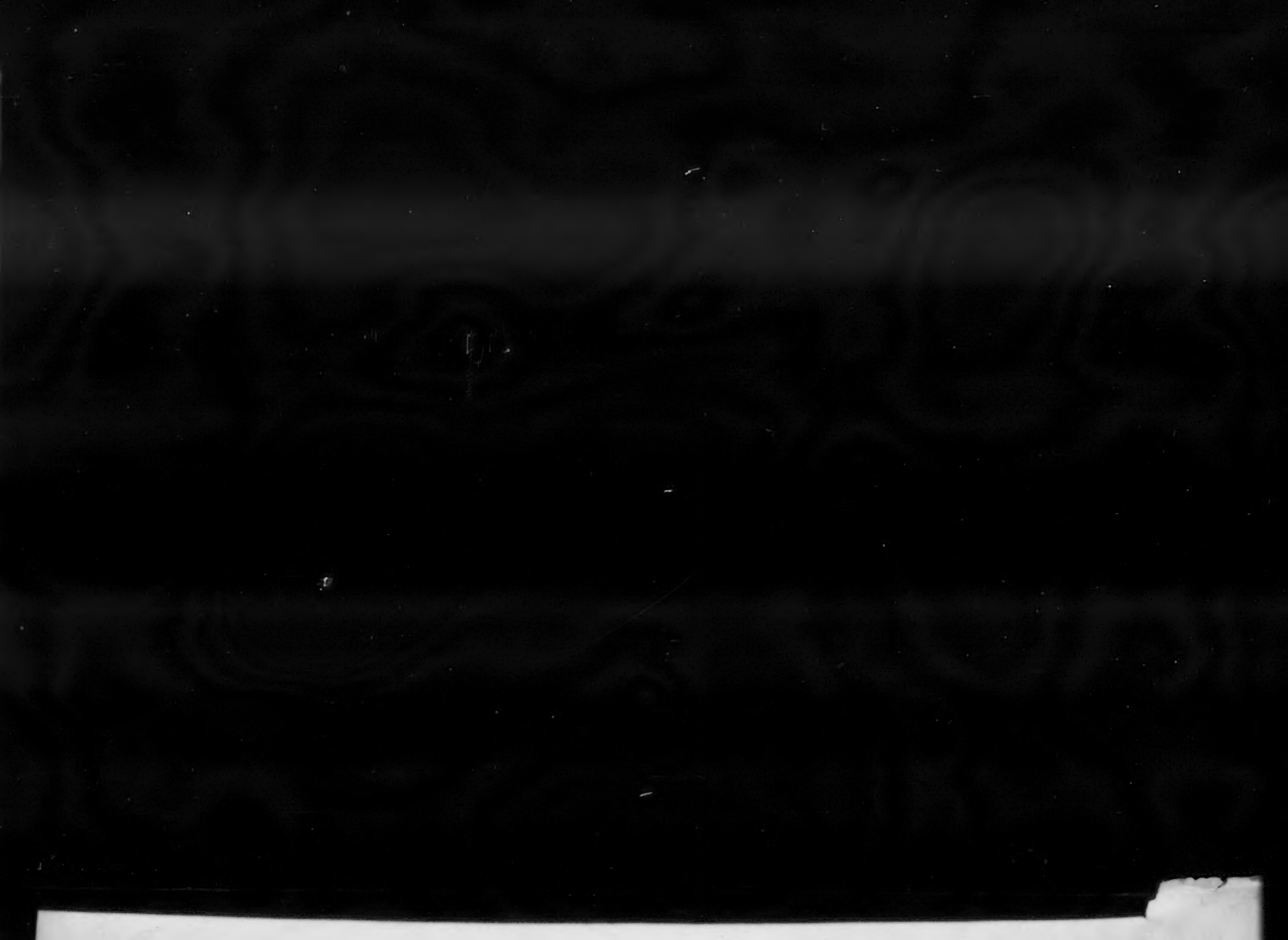
The bearing of investigations of oceanic circulation upon seasonal weather forecasting has already been touched upon in the *Geographical Review*, and detailed discussion is to be found in the *Monthly Weather Review*, November, 1918 (pp. 510-512).

A useful bibliography on physical oceanography and the meteorological aspects of oceanography occupies the last two pages of this interesting historical sketch.

CHARLES F. BROOKS

BROOKS, C. F. **Ocean temperatures in long-range forecasting.** *Monthly Weather Rev.*, Vol. 46, 1918, No. 11, pp. 510-512. Washington, D. C. ["Paper presented at the Baltimore meeting of the Association of American Geographers, Dec. 28, 1918." Also published in *Scientific American Supplement*, No. 2254, Vol. 87, 1919, March 15, pp. 166-167.]

COLOSI, GIUSEPPE. **Per una classificazione delle regioni zoogeografiche marine.** Map, bibliogr. *Memorie Geogr.* (Suppl. to *Riv. Geogr. Italiana*) *No. 37* (Vol. 13, pp. 1-54). Florence, 1919.

LITTLEHALES, G. W. **The physical characteristics of the ocean depths.** Maps, diagrs. *U. S. Naval Inst. Proc.*, No. 191, Vol. 45, 1919, January, pp. 45-60. Annapolis.

STIASNY, GUSTAV. **Das Plankton des Meeres.** 160 pp.; maps, diagrs., ills., index. (Sammlung Göschen, No. 675.) G. J. Göschen'sche Verlagshandlung, Berlin & Leipzig, 1913. 90 pfg. 6½ x 4.